AIR FORCE

QUALIFICATION TRAINING PACKAGE (AFQTP)

for

UTILITIES SYSTEMS

(3E4X1)

MODULE 22

FIXTURES AND RELATED COMPONENTS

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MODULE 22

FIXTURES AND RELATED COMPONENTS

Career Field Education and Training Plan (CFETP) references from 1 Apr 97 version.

OPR: HQ AFCESA/CEOT

Certified by: HQ AFCESA/CEO
(Colonel Lance C. Brendel)

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INTRODUCTION

Before starting this AFQTP, refer to and read the "Trainee/Trainer Guide" located on the AFCESA Web site **http://www.afcesa.af.mil/**

AFQTPs are mandatory and must be completed to fulfill task knowledge requirements on core and diamond tasks for upgrade training. ***It is important for the trainer and trainee to understand*** that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.

MANDATORY minimum upgrade requirements:

Core task:
AFQTP completion
Hands-on certification

Diamond task:
AFQTP completion
CerTest completion (80% minimum to pass)

Note: *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location.*

Put this package to use. Subject matter experts under the direction and guidance of HQ AFCESA/CEOT revised this AFQTP. If you have any recommendations for improving this document, please contact the Career Field Manager at the address below.

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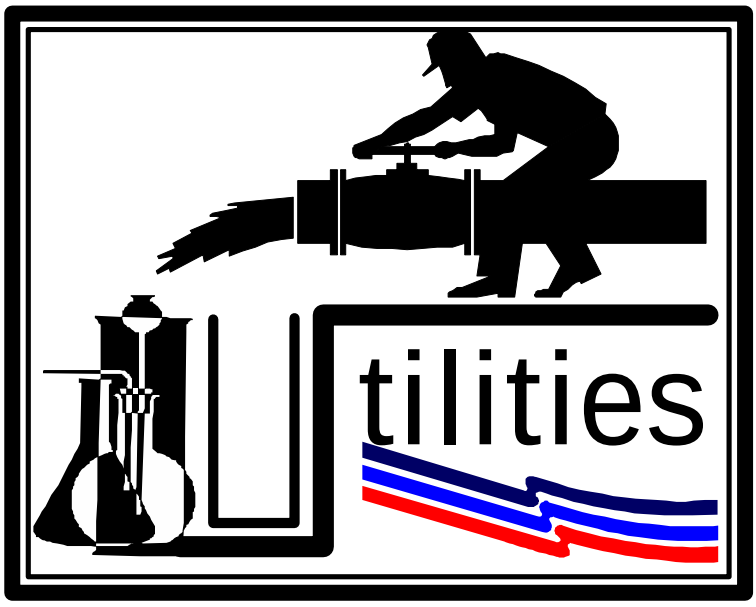
Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.



INSTALL

MODULE 22 AFQTP UNIT 1

LAVATORIES (22.1.1.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

LAVATORIES

Task Training Guide

STS Reference Number/Title:	22.1.1., Lavatories
Training References:	• Study Guide/Workbook J3ABRE431 • CDC 3E451 • AFJMANs 32-1070 • Uniform Plumbing Code
Prerequisites:	• Possess as a minimum a 3E431 AFSC.
Equipment/Tools Required:	• Lavatory, Appurtenances, • Basic Plumbing tools
Learning Objective:	• Trainee should understand how to install a lavatory.
Samples of Behavior:	• Trainee will be able to install a lavatory.
Notes:	

LAVATORIES

Background: Lavatories are available in many different shapes and sizes. There are four types of lavatories, including: wall hung, countertop, trough, and pedestal. Lavatories are also installed in many different ways. The drain for a lavatory has a minimum diameter of 1 ¼ inch.

NOTE:
Always remember to refer to the manufacturer's specifications prior to the installation.

The **wall hung** lavatory is used extensively. A wall hung lavatory may be enclosed in a cabinet to give a vanity effect and add storage to the bathroom. A wall hung lavatory will contain a wall mount or special hanging brackets to secure the fixture to the wall. The hanger is fastened by brass screws to a 2 x 6 inch board nailed securely between two studs at a height recommended by the manufacturer. The lip height of a lavatory is usually 31 inches from the finished floor, unless otherwise specified by the manufacturer.

The **countertop** lavatory (also called flat rim) is widely used in hotels and private homes. The most popular trend in lavatories is the built-in or vanity design. This type of lavatory may come as a complete unit or installed in a vanity or cabinet. The lavatory is secured in place by retaining clips. Make sure manufacturer's recommendations are followed.

The **trough** and **pedestal** lavatories are not as popular as the flat-rim and wall-hung. The trough lavatory is mainly for industrial or commercial use. Pedestal lavatories are bolted or cemented to the floor. The drain for pedestal lavatories pass through the floor instead of the wall. Pedestal type lavatories are being replaced, because of the S-traps used with this fixture.

INSTALLATION OF LAVATORIES. (See Figure 1).

To perform this task, follow these steps:

Step 1: Gather required equipment and supplies.

Step 2: Shut off water supply.

Step 3: Install angle valves
Use a common smooth jaw wrench.

Step 4: Measure the height at which the lavatory is to be installed.
- Use the manufacturer's specifications to find the height.
- This information will give you the height and location at which to install the lavatory hanger bracket.

NOTE:
Always remember to refer to manufacturer's specifications for assistance prior to installation.

Step 5: Install hanger bracket using drill and common hand tools.
- Use brass screws to install the hanger bracket

Step 6: Install drain tailpiece on the fixture.

- Use plumbers putty and hand tools.
- Apply plumbers putty to the underside of the tailpiece flange.
- Insert tailpiece into the lavatory opening.
- Place a conewasher on the tailpiece and install a locknut.

Step 7: Install faucet on the fixture.

- Place the rubber gasket on the underside of the faucet.
- Place the faucet on the top of the lavatory and insert it through the lavatory opening.
- Secure the faucet to the lavatory using lock washers and lock nuts.

Step 8: Install lavatory on to the hanger bracket.

- Ensure that the lavatory is centered and you have the right lip height.

Step 9: Intall P-trap and trap arm to complete the fixture drain.

- Use a Ford (Monkey) wrench.

Step 10: Install water supply lines.

- Cut and bend flex connectors to fit between the angle stops and fixture.
- Use wrenches and a basin wrench to tighten the compression joints.

Step 11: Turn on water supply.

Step 12: Perform visual inspection of water supply lines and drain for leaks.

Step 13: Tighten fittings if leaks are found.

Step 14: Remove aerator to remove dirt, rust and debris if required.

Step 15: Reinstall aerator

Step 16: Clean work area

Step 17: Put up equipment and supplies

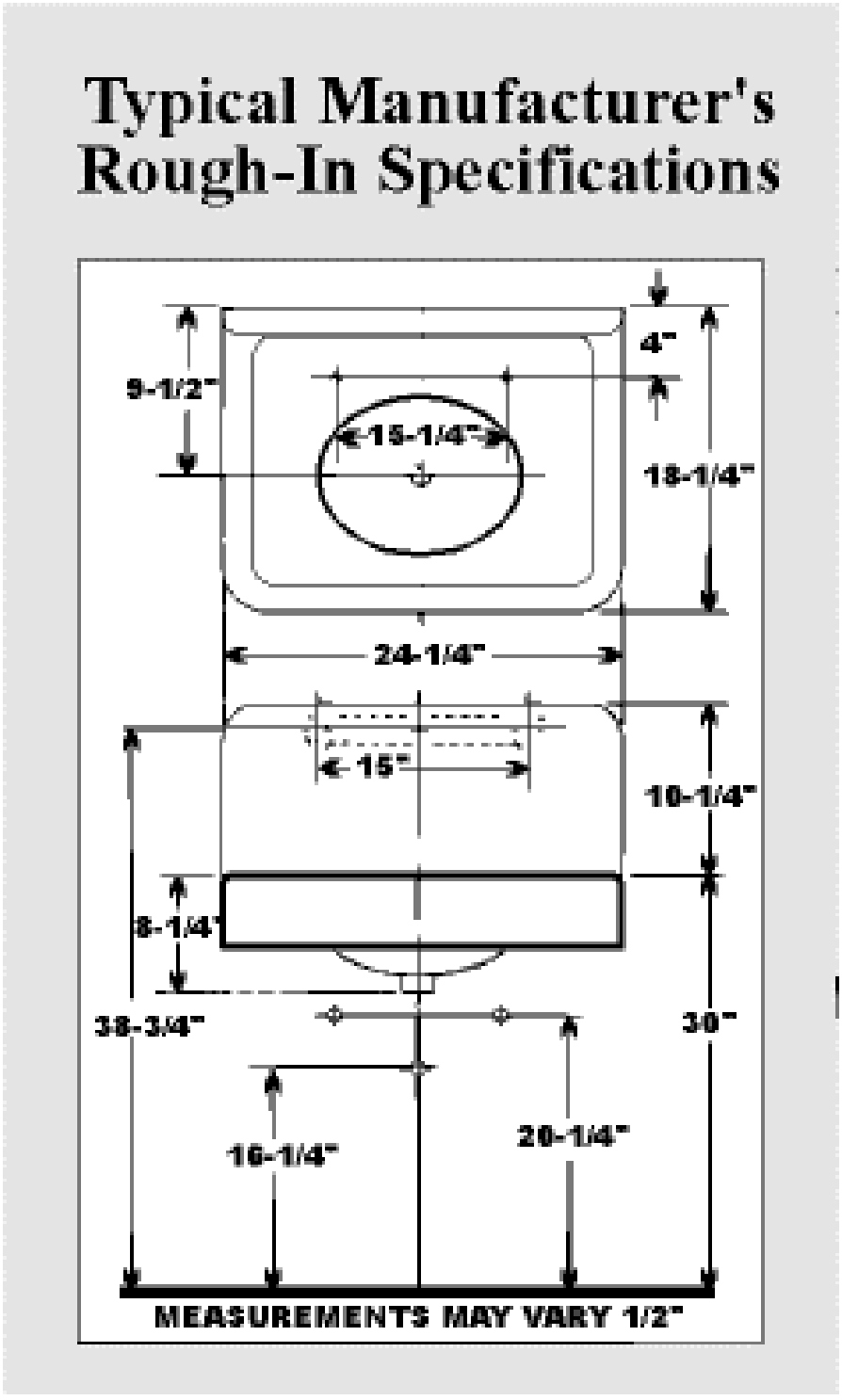


Figure 1, Example of a Lavatory

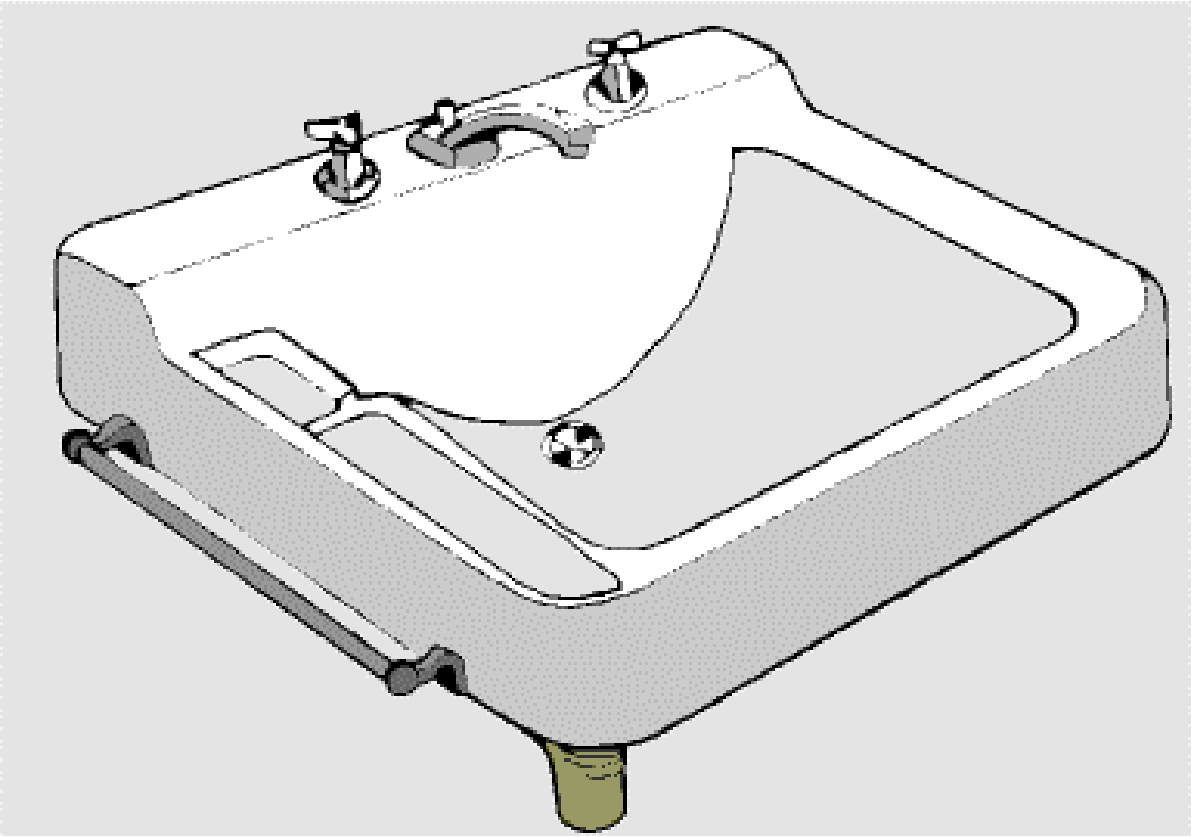


Figure 2, Wall Hung Lavatory

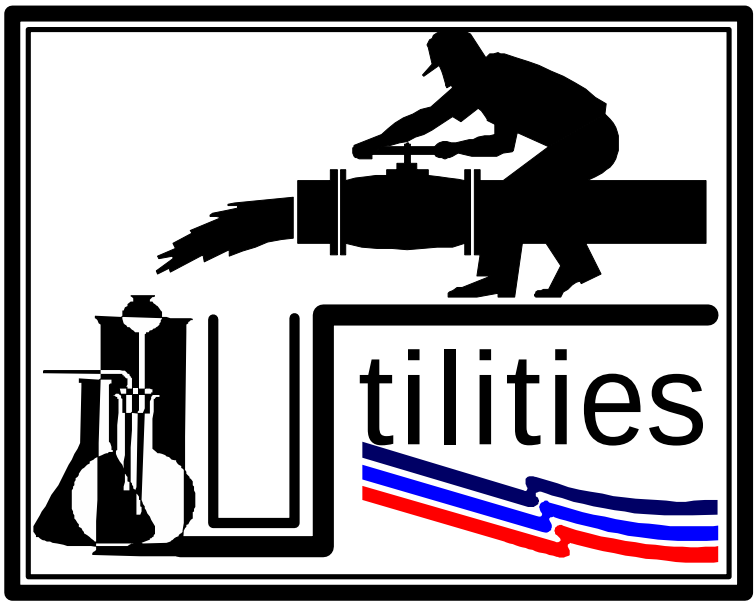
Review Questions
for
Lavatories

Question	Answer
1. What should you follow when before installing a lavatory?	a. CDCs b. Manufacturer's Surveys c. Manufacturer's Specifications d. All of the above
2. Which lavatory is secured by retaining clips.	a. Countertop b. Pedestal c. Trough d. All of the above
3. 1 ½ inch is the minimum size for a lavatory drain .	a. True b. False
4. Which lavatory contains an "S"-trap?	a. Countertop b. Pedestal c. Trough
5. What is the minimum height of a wall hung lavatory?	a. 28 inches b. 30 inches c. 31 inches d. 33 inches

LAVATORIES

Performance Checklist		
Step	**Yes**	**No**
1. Did trainee identify all the equipment needed for the job? • Lavatory • Supply lines • Plumbers putty • Trap arm, P-trap, Tailpiece • Hanger bracket		
2. Did the trainee take proper safety precautions?		
3. Did the trainee understand how to install a lavatory?		
4. Did the trainee properly install the lavatory? • Gather required equipment and supplies. • Shut off water supply. • Install angle valves • Measure height at which the lavatory is to be installed. • Install hanger brackets to wall using drill and common hand tools. • Install drain tailpiece on the fixture. • Install faucet on the fixture. • Install lavatory onto hanger brackets. • Install P-trap and trap arm to complete the fixture drain. • Install water supply lines. • Turn on water supply. • Perform visual inspection of water supply lines and drain for leaks. • Tighten fittings if leaks are found. • Remove aerator to remove dirt, rust and debris if required. • Reinstall aerator • Clean work area • Put up equipment and supplies		
5. Did the trainee complete all the questions in the QTP? • Score 80% or higher • Did the trainer review and explain all missed questions?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



INSTALL

MODULE 22 AFQTP UNIT 1

WATER CLOSETS (22.1.2.)

WATER CLOSETS

Task Training Guide

STS Reference Number/Title:	22.1.2., Water Closets
Training References:	• Study Guide/Workbook J3ABR3E431
Prerequisites:	• Possess as a minimum a 3E431 AFSC
Equipment/Tools Required:	• Water Closet • Components • Hand tools • Wax ring • Flexible supply
Learning Objective:	• Trainee will learn to install water closet using manufacturers instructions furnished with the fixture
Samples of Behavior:	• Trainee will be able to install a water closet.
Notes:	
• Steps will be followed in sequence • Any safety violation is an automatic failure	

WATER CLOSETS

Background: There are two kinds of water closets commonly used on Air Force installations, the wall-hung and the floor mounted. Two different flushing devices are associated with the water closet. The first one is the flushometer type flush valve and the second is the tank type. The tank type is used in residences because it is not as noisy as a flushometer and does not require a larger supply line. To support the wall-hung water closet, either a horizontal or vertical chair carrier is used. This adjustable combined fitting and chair carrier permits each wall-hung closet to be set at a uniform height from the floor when installed in a battery of similar fixtures. Although wall-hung water closets are used, the most commonly used by the Air Force is the floor mounted.

NOTE:
There are many different manufacturers' of water closets, so always refer to the manufacturer's instructions and specifications furnished with the fixture.

Given that the rough-in has already been provided the following steps will enable the trainee to install a water closet.

SAFETY:
IF YOU ARE TO LEAVE THE AREA FOR AN EXTENDED PERIOD OF TIME YOU NEED TO SEAL OFF OPENING TO THE DRAIN LINE, TO PREVENT HARMFUL SEWER GASES FROM GETTING INTO THE WORK AREA.

INSTALLATION OF WATER CLOSET. (See Figure 1).

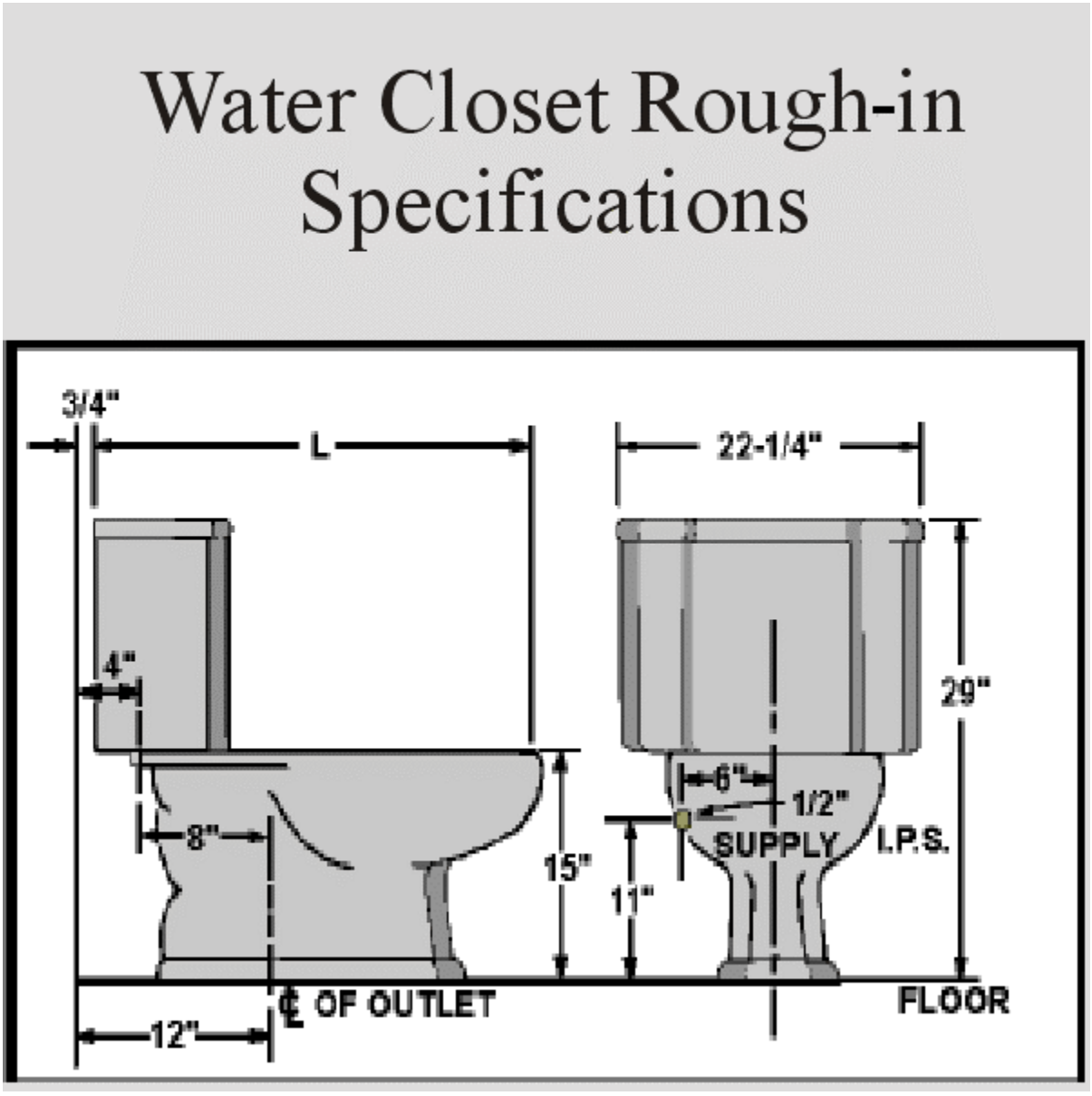


Figure 1, Example of a Water Closet

To perform this task, follow these steps:

Step 1: Gather needed parts and proper hand tools.

Step 2: Check floor to insure that it is level.

- If the floor is not level or if the floor has been raised above the top of the closet flange, use two wax rings.

Step 3: To prevent scratching the bowl, invert it and place it on a piece of wood or paper.

- Do not drop the bowl it is FRAGILE.

Step 4: Firmly place the wax ring around the horn (outlet) of the water closet.

Step 5: Secure closet bolts provided to the flange.

Step 6: Turn bowl over and carefully line up the holes in the bowl with the closet bolts.
- Carefully set bowl into place.

Step 7: Rock bowl gently to seal bowl onto flange
- This will ensure that the wax ring seals to the bowl and to the flange.

HINT:
Do not over-tighten any parts on the bowl or tank, they will crack or break easily. It is better to fix a leak than buy a new commode and tank.

Step 8: Slowly tighten the nuts alternately but do not over-tighten.
- Over-tightening the nuts will crack the bowl.
- You are now ready to attach tank or flushometer to water closet bowl.

NOTE:
If water closet is a flushometer kind refer to the manufacturers instructions for flushometers and perform Steps 9, 17, and 20. If water closet is a tank type water closet go to Step 10.

Step 9: Install the flush valve
- Place the cone washer on the bottom of the valve.
- Insert the valve through the tank and secure with the locknut.

HINT:
Flush valves differ from manufacturer to manufacturer, see specification sheets for proper installation procedures.

Step 10: Install ballcock assembly into tank.
- Install a cone washer on the bottom of the ballcock.
- Insert the ballcock through the tank and secure to the tank with the lock nut.

HINT:
Ballcock valves may differ from manufacturer to manufacturer. See specification sheets for proper installation procedures.

Step 11: Ensure the hush tub is installed.

Step 12: Screw the float rod and ball into the top of the ballcock.

Step 13: Connect water supply to the ballcock.

Step 14: Install the trip handle.

- Remember that it has reverse threads.

Step 15: Connect lift arm to the flapper with a chain.

Step 16: Make sure the tank gasket (doughnut gasket) fits the opening of the bowl.

- The doughnut gasket should be placed on the flush valve protruding through the bottom of the tank.

Step 17: Attach tank to bowl with tank bolts provided, inserting them through the holes in the tank.

- The bolts should come with rubber seals to seal the interior and exterior openings on the tank

Step 18: Alternate the tightening of nuts to insure that the tank will be level.

Step 19: Turn on water supply and test for leaks and proper operation.

Step 20: Caulk around the base of the closet bowl to prevent water from leaking under the bowl.

Step 21: Clean up area.

Step 22: Put away equipment.

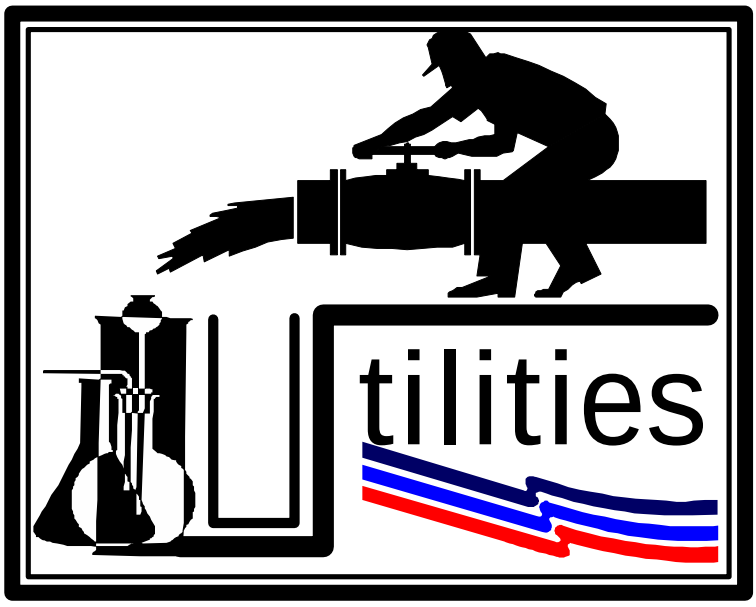
Review Questions
for
Water Closets

Question	Answer
1. What two kinds of water closets are there?	a. Wall-hung and floor mounted b. Floor-hung and wall mounted c. Corner mounted d. None of the above
2. Which is the most commonly used water closet on Air Force installations?	a. Floor mounted b. Floor-hung c. Wall mounted d. Wall-hung
3. What should you always refer to when installing a water closet?	a. Self-help literature b. Manufacturers brochures c. Manufacturers specifications d. Any of the above
4. What may be needed if the floor has been raised above the top of the closet flange?	a. The first wax ring b. A second wax ring c. A third wax ring d. A fourth wax ring
5. How do you seal the wax ring to the flange?	a. Rock closet bowl gently b. Rock closet bowl firmly c. Use a rubber mallet d. Use a 5lb. ball-peen hammer
6. Why should you never over tighten nuts on a bowl?	a. The nut will strip b. The bolt will strip c. The water closet will crack d. You can never over tighten bowl nuts
7. Where do you hook up the water supply?	a. To the bowl b. To the ballcock assembly c. To the effluent valve d. To the influent valve

WATER CLOSETS

Performance Checklist		
Step	**Yes**	**No**
1.		
2. Did trainee identify all the equipment needed for the job? • Closet bowl • Closet tank • Ballcock assembly • Doughnut gasket • Flush valve • Wax ring • Lift arm		
3. Did the trainee take proper safety precautions?		
4. Did the trainee know the different types of flushing devices?		
5. Did the trainee complete job with no leaks? • Gather needed parts and proper hand tools. • Check floor to insure that it is level. • Firmly place the wax ring around the horn of the water closet. • Secure closet bolts provided to the flange. • Turn bowl over line up the holes in the bowl with the closet bolts. • Rock bowl gently to seal bowl onto flange • Tighten the nuts alternately but do not over-tighten. • Install the flush valve • Install ballcock assembly into tank. • Connect water supply to the ballcock. • Install trip lever. • Connect lift arm to flush valve assembly • Make sure the doughnut gasket aligns with the opening of the bowl. • Attach tank to bowl with tank bolts provided • Alternate the tightening of nuts to insure that the tank will be level. • Turn on water supply and test for leaks and proper operation. • Clean up area. • Put away equipment.		
6. Did the trainee complete all the questions in QTP? • Score 80% or higher • Did the trainer review and explain all missed questions?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



INSTALL

MODULE 22 AFQTP UNIT 1

URINALS (22.1.3.)

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URINALS

Task Training Guide

STS Reference Number/Title:	22.1.3., Urinals
Training References:	• UPC • AFJMANs 32-1070 • CDC 3E451 • Study Guide/Workbook J3ABR3E431
Prerequisites:	• Possess as a minimum a 3E431 AFSC.
Equipment/Tools Required:	• Manufacturers specifications • Urinal • Trap • Flushometer • Hand tools
Learning Objective:	• Trainee should be able to install a urinal.
Samples of Behavior:	• Trainee will be able to install urinal to include the angle valve.
Notes:	
• Any safety violation is an automatic failure	

URINALS

Background: A urinal is plumbing fixture that is designed to receive and dispose of urine. There are four basic types of urinals: the **wall hung, pedestal, trough, and stall.** Urinals come in a wide variety of different styles. The flushing device used for urinals is the flushometer. There are two types of flushometers, piston type and diaphragm type. Both types of flushometers are installed in the same manner. The most common types of urinals used by the military is the wall-hung and the pedestal. The pedestal type urinal is installed in the same manner as a water closet. The urinal is sealed to the floor flange by using a wax ring. The advantage of using a pedestal type urinal is the larger drain which reduces the problem of stoppages. There are two types of wall hung urinals, the siphon jet fixture with an integral (internal) trap. Another type is the wall-hung urinal with an external (exposed) trap. This type has a 1-1/2" P-trap and a minimum of a 1-1/4" vent. The lip height for wall hung urinals is between **20 to 25** inches. .The minimum size drain for a wall hung urinals is 2". A 2" x 6" backing board is needed to support a urinal. All urinals should be installed to manufacturers specifications.

INSTALLATION OF URINALS. (See Figure 1).

To perform this task, follow these steps:

Step 1: Obtain fittings, tools and urinal needed to perform the task.

Step 2: Ensure the supply is turned off.

Step 3: Install the ¾" spud on top of urinal.

- Use a spud wrench and an adjustable jaw wrench (crescent or monkey).

Step 4: Install 1 ½" spud on the bottom of the urinal for the external trap.

NOTE:
Do not over tighten the spud, doing so could cause a crack in the fixture.

Step 5: Install hanger bracket on the backing board.

- Use manufacturer's specifications to determine the height at which to install the hanger bracket.

Step 6: Place urinal on hanger bracket.

Step 7: Install angle valve on the ¾" supply line.

Step 8: Fasten flushometer to the angle valve.

Step 9: Attach the flushometer tailpiece to the ¾" spud on top of urinal.

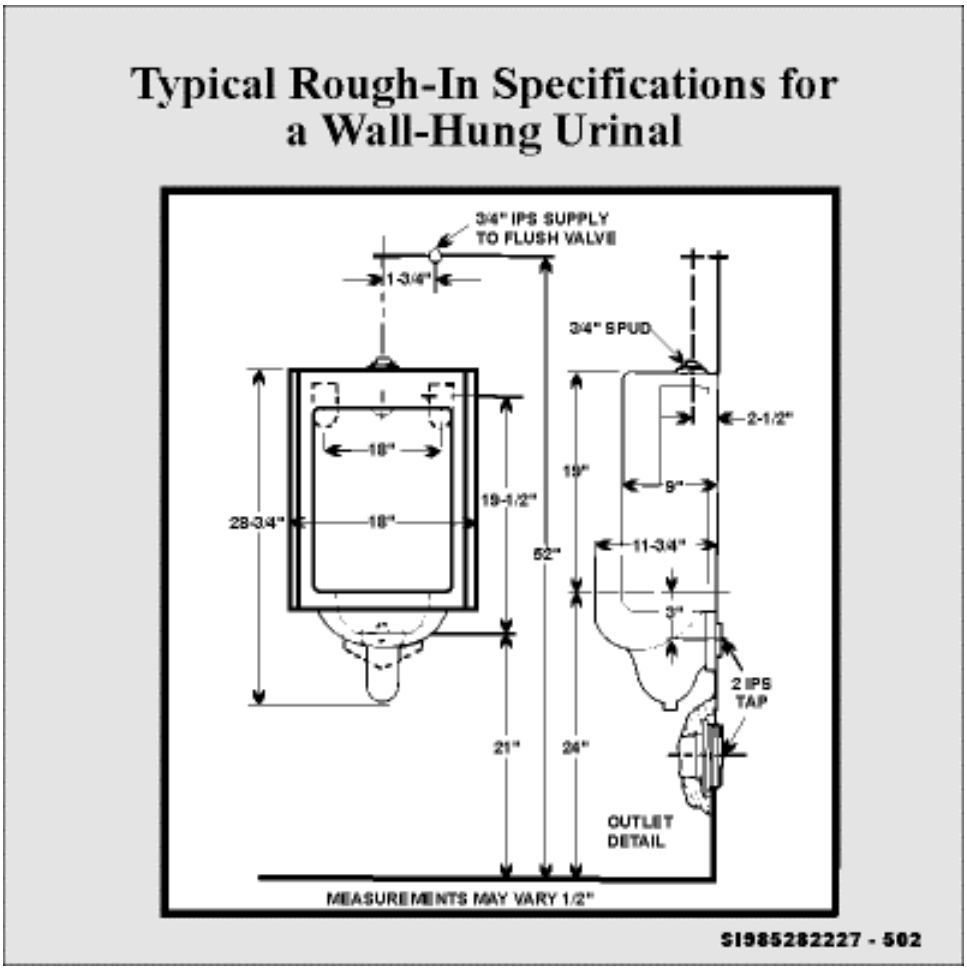


Figure 1, Example of a Urinal Rough-in

Step 10: Install the 1 ½" P-trap and trap arm to complete the installation.

- Fixture drain connections need to be hand tightened only.
- If leaks occur when supply is on tighten with a ford (monkey) wrench.

Step 11: Turn on water and check for leaks.

Step12: If there are leaks shut off supply at the angle valve and repair.

Step 13: If no leaks occur collect equipment and clean the area.

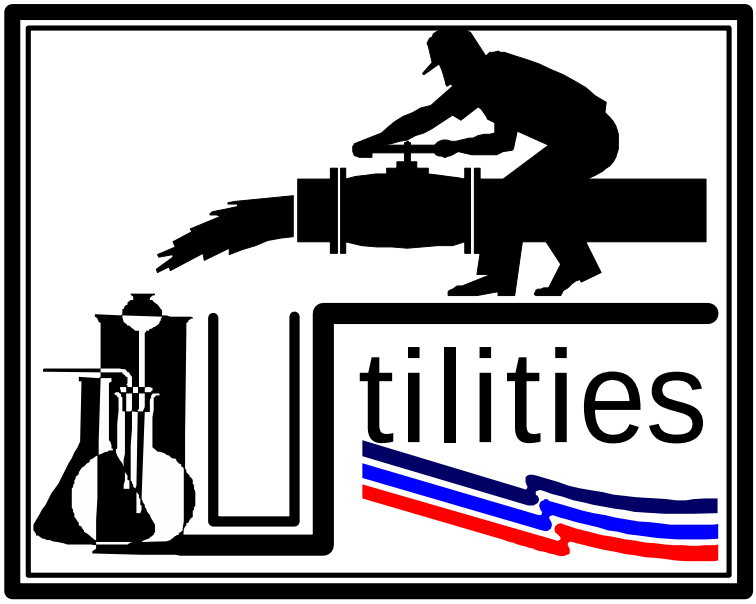
Review Questions for Urinals

Question	Answer
1. What is the minimum size drain line that can be used for urinals?	a. 1” b. 2” c. 3” d. 4”
2. What is the lip height of a wall hung urinal?	a. 10-15” b. 20-25” c. 30-35” d. 40-45”
3. What is the minimum size P-trap that can be installed on a urinal ?	a. 1-½” b. 2-½” c. 3-½” d. 4-½”
4. What should be used in all installations of urinals?	a. Manufacturer’s specifications b. CDCs c. Common sense d. Speed

URINALS

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee identify all the equipment and tools needed for the job? • Urinal • Hanger bracket • ¾" spud • 1 ½" spud • Flushometer • Angle valve • Fixture Drain (Tailpiece, trap arm, P-trap) • Tools		
2. Did the trainee use proper safety precautions ?		
3. Did the trainee complete the job with no leaks? • Obtain fittings, tools and urinal needed to perform the task. • Ensure the supply is turned off. • Install the ¾" spud on top of urinal. • Install 1 ½" spud on the bottom of the urinal for the external trap. • Install hanger bracket on the backing board. • Place urinal on hanger bracket. • Install angle valve on the ¾" supply line. • Fasten flushometer to the angle valve. • Attach the flushometer tailpiece to the ¾" spud on top of urinal. • Install the 1 ½" P-trap and trap arm to complete the installation. • Turn on water and check for leaks. • If there are leaks shut off supply at the angle valve and repair. • If no leaks occur collect equipment and clean the area.		
4. Was the work area cleaned up after task was completed ?		
5. Did trainee complete all the questions in the QTP ? • Score 80% or higher • Did the trainer review and explain all missed questions?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



INSTALL

MODULE 22 **AFQTP UNIT 1**

SHOWERS (22.1.4.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

SHOWERS

Task Training Guide

STS Reference Number/Title:	22.1.4., Showers
Training References:	• UPC • AFJMANs 32-1070 • CDC 3E451 • Study Guide/Workbook J3ABR3E431
Prerequisites:	• Possess as a minimum a 3E431 AFSC.
Equipment/Tools Required:	• Basic plumbing hand tools
Learning Objective:	• Trainee will install a shower.
Samples of Behavior:	• Trainee will understand the steps to install showers
Notes:	

SHOWERS

Background: There are many types of showers. They may consist of one shower head installed in a residence or a series of heads installed in a large shower area, this type of shower is known as a "gang shower." This type can be found in industrial buildings, schools, gymnasiums, etc. The minimum size drain for a single shower is 2 inches in diameter. A gang shower consists of a minimum 3 inch diameter drain. The most important parts of a shower are the mixing valve and shower head. The shower head is connected to a 45 degree chrome-plated pipe called a shower arm. The two general types of shower heads are circular and economy. The circular allows regulation of spray, while the economy uses less water than other type heads.

NOTE:
There are many different manufacturers' of showers and they come in various shapes and sizes so it is important that you read manufacturer's specifications before installation.

There are two general classes of showers. Those that discharge into a bathtub (tub and shower combination) and those that discharge into a separate receptor. The latter (the vertical run of pipe to the showerhead) constitutes a shower.

Many modern homes and apartments use prefabricated shower stalls made of plastics and fiberglass. These stalls can be bolted, screwed, or nailed to the studs in the wall.

Tiled showers consist of a shower pan constructed of lead or copper. The pan must be at least 3 inches above the finished dam or threshold. A shower pan is installed to prevent leaks between the tiled shower walls and the floor. Before installing a pan for the tiled shower, the carpenter must rough in the general outline of the shower stall and provide a solid base of sub-floor or plywood on which the shower pan will rest. If not supported properly, the pan will sag under the weight of the concrete and tile. This may cause leaks to occur.

INSTALL SHOWER. (See Figures 1 and 2).

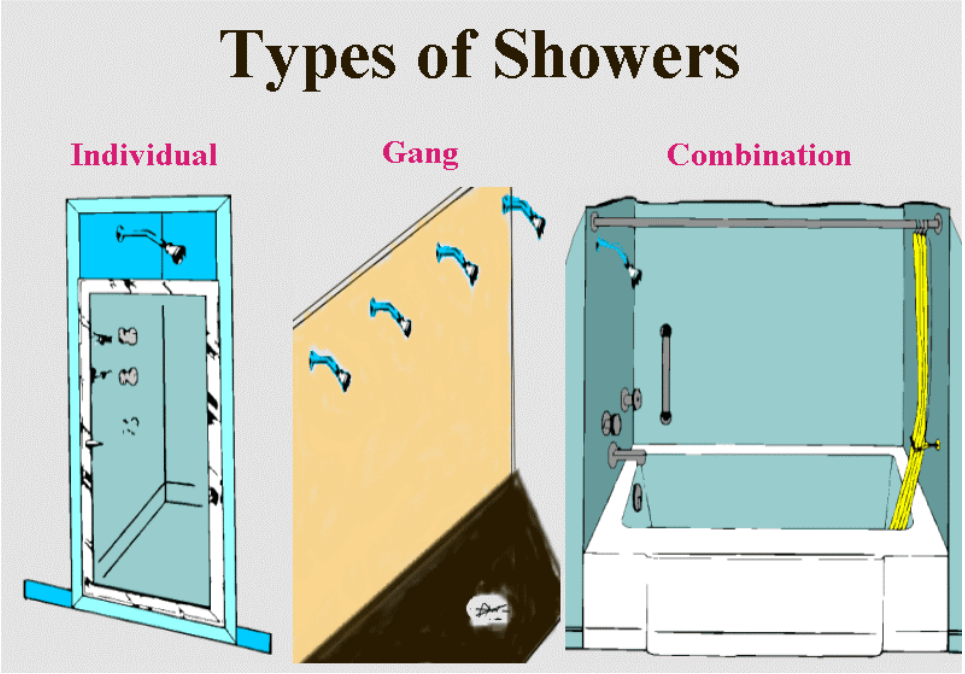


Figure 1, Examples of a Showers

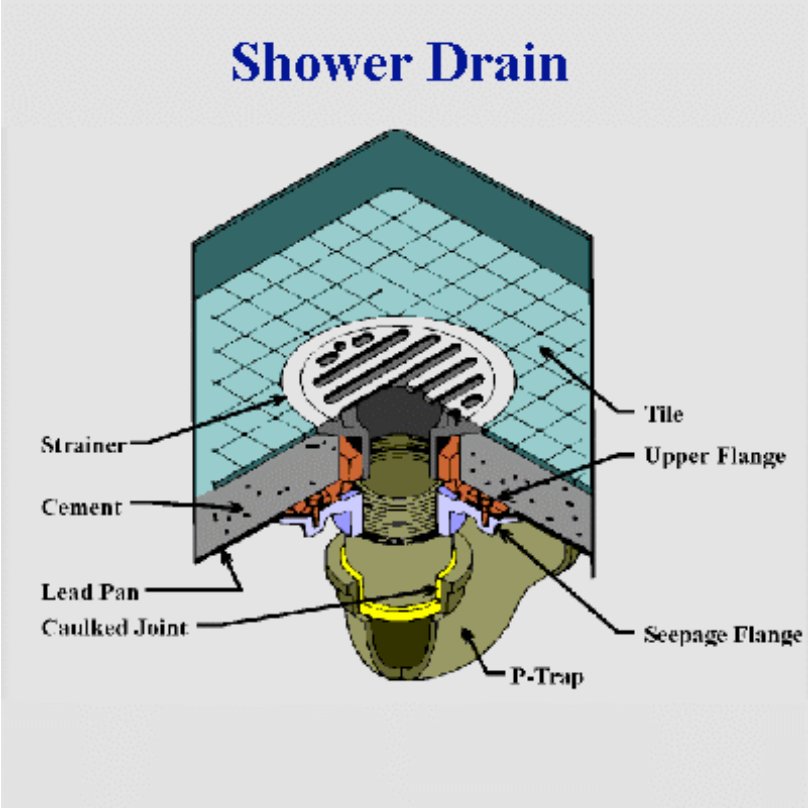


Figure 2, Shower Drain

INSTALL SHOWER.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

To perform this task, follow these steps:

Step 1: Gather required equipment and supplies.

Step 2: Shut off water supply.

Step 3: Bend the edges of the shower pan at upright angles to the floor.

NOTE:
Shower pan must extend at least 3 three inches above the finished floor.

Step 4: Fold the corners to right angles.

Step 5: Weld the corners.

SAFETY:
ALWAYS OBTAIN AN APPROVED WELDING PERMIT AND FIRE EXTINGUISHER BEFORE SOLDERING, BRAZING OR WELDING.

Step 6: If supply and waste lines are not in place refer to QTP module 11.

Step 7: Cut a hole in the pan where the drain is located.

Step 8: Apply a layer of putty on the seepage flange.

Step 9: Lower the shower pan into place.

Step 10: Coat the inside of the pan with asphalt.

Step 11: Screw the upper flange into the seepage flange.

Step 12: Remove the strainer and stuff the drain with oakum to prevent cement from entering and plugging the shower drain.

Step 13: After the cement and tile are laid, remove the oakum and replace the strainer.

HINT:
Steps 14 thru 16 should be completed and tested for leaks before drywall is installed.

Step 14: Install mixing valve.

Step 15: Install vertical pipe for shower head at predetermined height.
- Use the manufacturer's specifications.

Step 16: Install shower arm.
- Apply Teflon tape to the shower arm.
- Use a strap wrench or a leather strap with a pipe wrench to install the sower arm this will prevent marring the chrome.

Step 17: Install shower arm.

Hint:
Steps 18 and 19 should be done after the tile has been installed

Step 18: Install escutcheons for the shower arm and mixing valves.

Step 19: Install the handles on the mixing valve.

Step 20: Clean up the area and collect equipment.

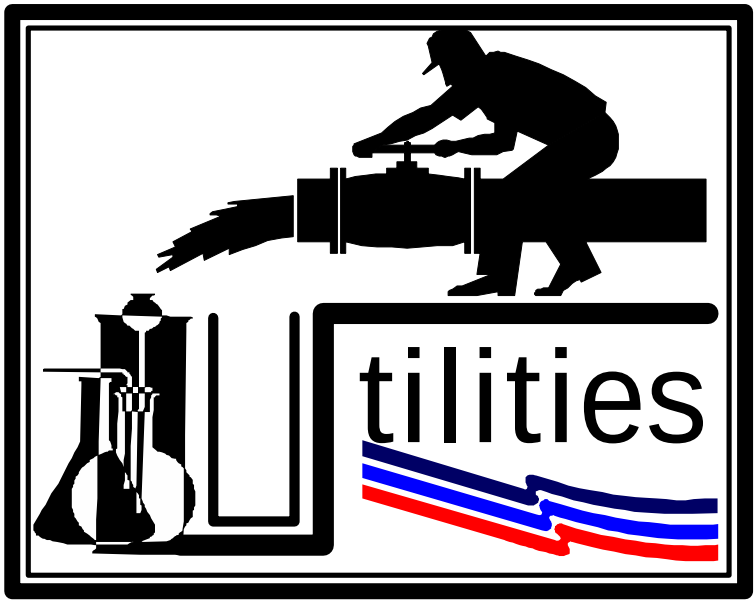
Review Questions
for
Showers

Question	Answer
1. What is the minimum size drain for a single shower?	a. 1” b. 2” c. 3” d. 4”
2. What is the minimum size drain for a gang shower?	a. 1” b. 2” c. 3” d. 4”
3. The shower pan must extend at least 3 inches above the finished floor.	a. True b. False
4. What will happen if the shower pan is not supported properly?	a. It will cause shifting b. It will cause stoppages c. It could leak d. Nothing will happen
5. What should be done before installing dry wall?	a. Install escutcheons. b. Install vertical pipe for shower head c. Install mixing valves d. Both b and c

SHOWERS

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee take safety precautions?		
2. Did the trainee understand how to install a shower?		
3. Did the trainee install shower following the steps in the QTP • Gather required equipment and supplies. • Shut off water supply. • Bend the edges of the shower pan at upright angles to the floor. • Fold the corners to right angles. • Weld the corners. • Cut a hole in the pan where the drain is located. • Apply a layer of putty on the seepage flange. • Lower the shower pan into place. • Coat the inside of the pan with asphalt. • Screw the upper flange into the seepage flange. • Remove the strainer and stuff the drain with oakum to prevent cement from entering and plugging the shower drain. • After the cement and tile are laid, remove the oakum and replace the strainer. • Install mixing valve. • Install vertical pipe for shower head at predetermined height. • Install shower arm. • Install escutcheons for the shower arm and mixing valves • Install the handles on the mixing valve. • Clean up the area and collect equipment.		
4. Did the trainee complete all QTP questions? • Score 80% or higher • Did the trainer review and explain all missed questions?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



INSTALL

MODULE 22 **AFQTP UNIT 1**

FAUCETS (22.1.7.)

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

FAUCETS

Task Training Guide

STS Reference Number/Title:	22.1.7., Faucets
Training References:	• AFJMANs 32-1070 • Study Guide/Workbook J3ABR3E431 • CDC 3E451
Prerequisites:	• Possess as a minimum a 3E431 AFSC.
Equipment/Tools Required:	• Faucet • Wrenches • Plumber's putty • Supply lines • Fittings
Learning Objective:	• Trainee will learn to install water faucet using manufacturer's instructions furnished with the fixture
Samples of Behavior:	• Trainee will be able to install a faucet.
Notes:	
• Steps will be followed in sequence as needed • Any safety violation is an automatic failure	

FAUCETS

Background: There are many styles of single and combination faucets. Those faucets that have a common spout are called mixing faucets. See Figure 1, Mixing Faucet. The installation procedures are essentially the same with some exceptions. Therefore you should always refer to the manufacturer's instructions before attempting to install a faucet.

NOTE:
Read the manufacturer's specification's regarding installation. Be aware of differences in brands that you may encounter.

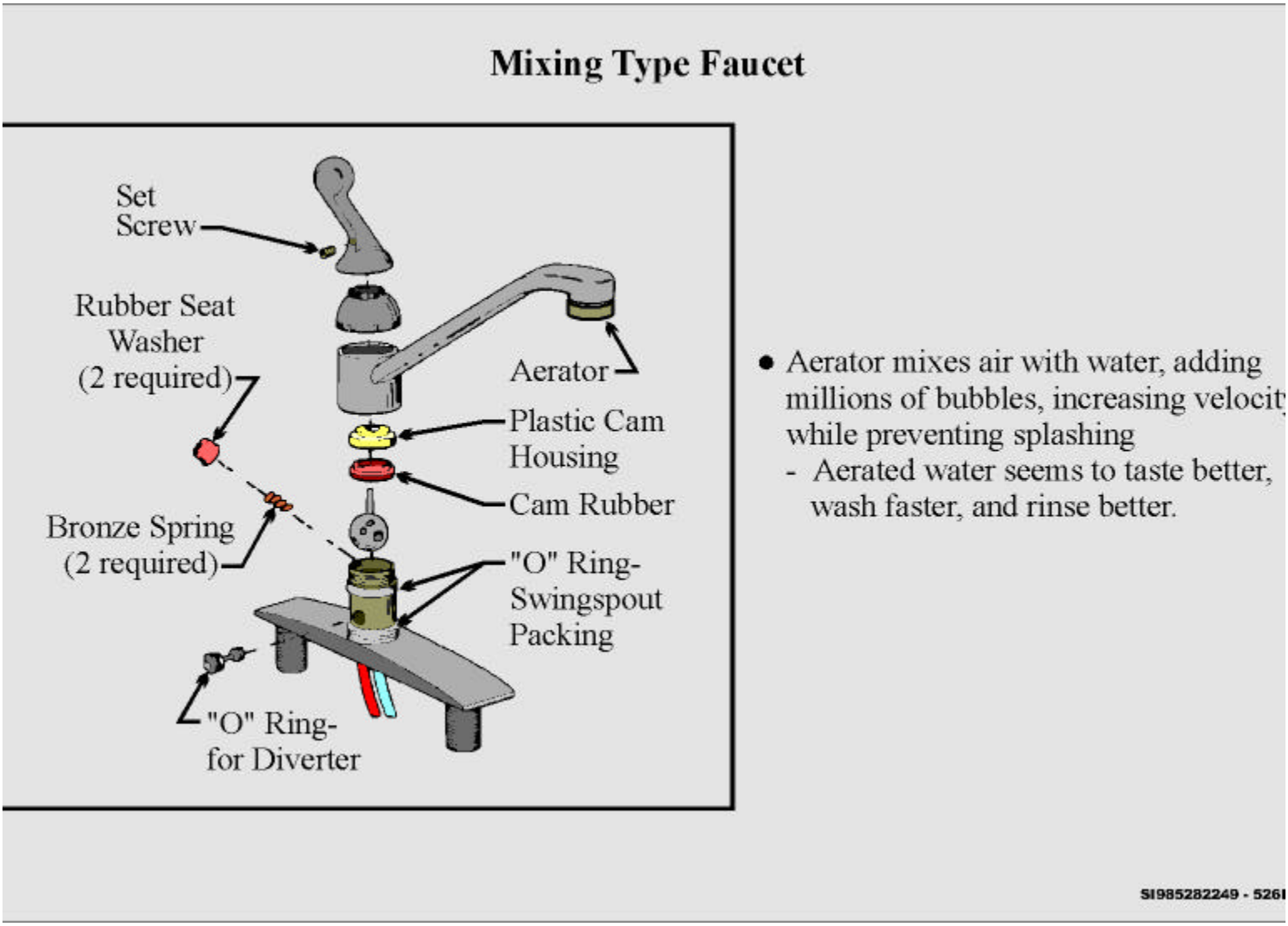


Figure 1, Mixing Faucet.

INSTALLATION OF FAUCETS. (See Figure 2, Faucet).

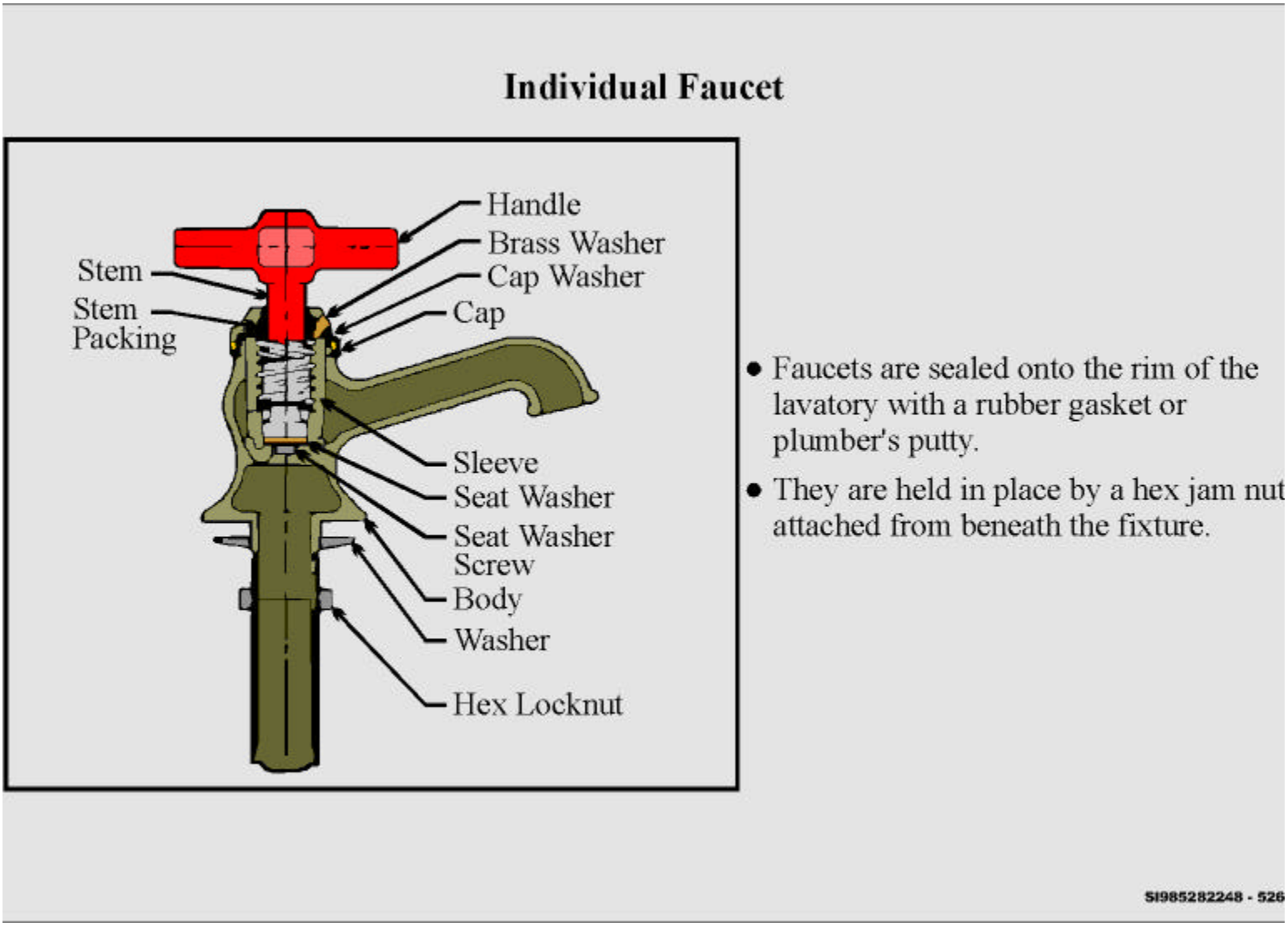


Figure 2, Faucet.

INSTALLATION OF FAUCETS.

To perform this task, follow these steps:

Step 1: Gather parts and appropriate tools needed.

Step 2: Install rubber gasket on the base of the faucet.

- Some faucets do not come with rubber gaskets, in this case a ¼ "roll of plumbers putty will be used to provide the seal.

Step 3: Insert the faucet into the fixture.

Step 4: Press the faucet down firmly to ensure a good seal.

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

Step 5: Secure faucet with the friction washers and jam nuts.

Step 6: Attach supply lines to the inlet of faucet using cone washers in conjunction with compression nuts.

Step 7: Attach supply lines to the angle stops, using ferrules and compression nuts.

- Hand tighten the compression nuts, then give them an extra quarter-turn with an adjustable wrench.

NOTE:

1. You may need to use a back-up wrench to hold the valve in place while you tighten the nuts

2. You may have to use a basin wrench to reach the compression nuts to the inlet of the faucet

Step 8: Turn on angle valves and check for leaks, repair any leaks at this time

Step 9: Clean up work area.

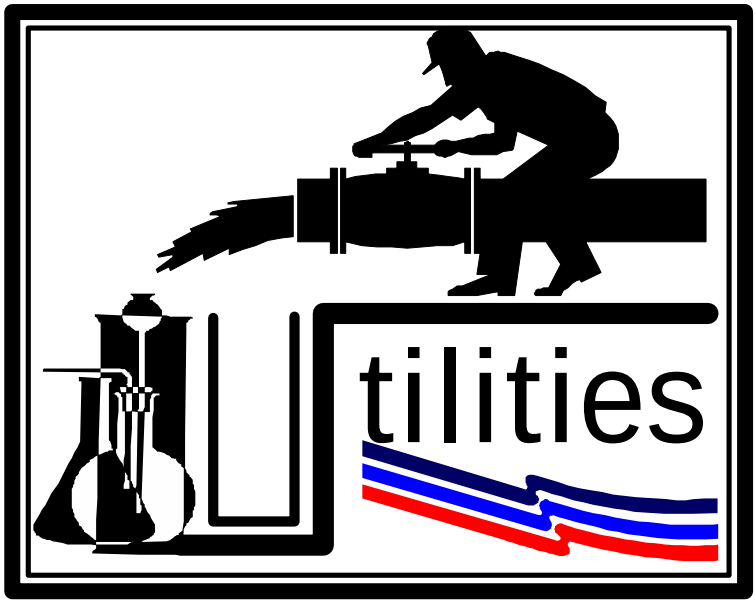
Review Questions
for
Install Faucets

Question	Answer
1. What should you always refer to when installing a faucet?	a. CDCs b. Manufacturer's specifications c. Plumbing journals d. All of the above
2. What size bead of putty do you apply to the base of the faucet?	a. ¼" b. ½" c. ¾" d. 1"
3. Why do you press the faucet down firmly to the sink?	a. To ensure a tight seal b. So the units will fuse together c. So the faucet will interlock d. None of the above
4. After installation of faucets what should be done?	a. Go to lunch b. Begin normal usage c. Make any final adjustments d. Check for leaks

FAUCETS

Performance Checklist		
Step	**Yes**	**No**
1. Did trainee identify all the equipment needed for the job?		
2. Did the trainee take proper safety precautions?		
3. Did the trainee install the faucet following the steps using the QTP and referring to the manufacturer's instructions? • Gather parts and appropriate tools needed. • Apply a rubber gasket to the base of the faucet. • Insert the faucet into the fixture. • Press the faucet down firmly to ensure a good seal. • Secure faucet the friction washers and jam nuts. • Attach supply lines to faucet. • Attach supply lines to the angle stops. • Turn on angle valves and check for leaks • Repair any leaks at this time**.** • Clean up work area.		
4. Did the trainee check for leaks and make final adjustments?		
5. Did trainee clean-up work area?		
6. Did the trainee complete all the questions in the QTP? • Score 80% or higher • Did the trainer review and explain all missed questions?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



REPAIR

MODULE 22 AFQTP UNIT 2

WATER CLOSET COMPONENTS (22.2.1.)

WATER CLOSET COMPONENTS

Task Training Guide

STS Reference Number/Title:	22.2.1., Water Closet Components
Training References:	• Study Guide Workbook J3ABR3E431 • CDC 3E451
Prerequisites:	• Possess as a minimum a 3E431 AFSC.
Equipment/Tools Required:	• General Plumbing Handtools
Learning Objective:	• Trainee will repair water closet components
Samples of Behavior:	• Trainee will understand the procedures for repairing water closet components
Notes:	

WATER CLOSET COMPONENTS

Background: There are many types of float-controlled valves, but most of them work on the same principle as the one used in a water closet tank to automatically control the water. Float-controlled valves are often called float valves (See Figure 1). There are many different float controlled valves used today one type is the flush-ball valve, which may be called a Douglas valve. Another type is the traditional plunger-valve. There are also float cup ballcocks (also know as a Fluidmaster); and floatless ballcocks.

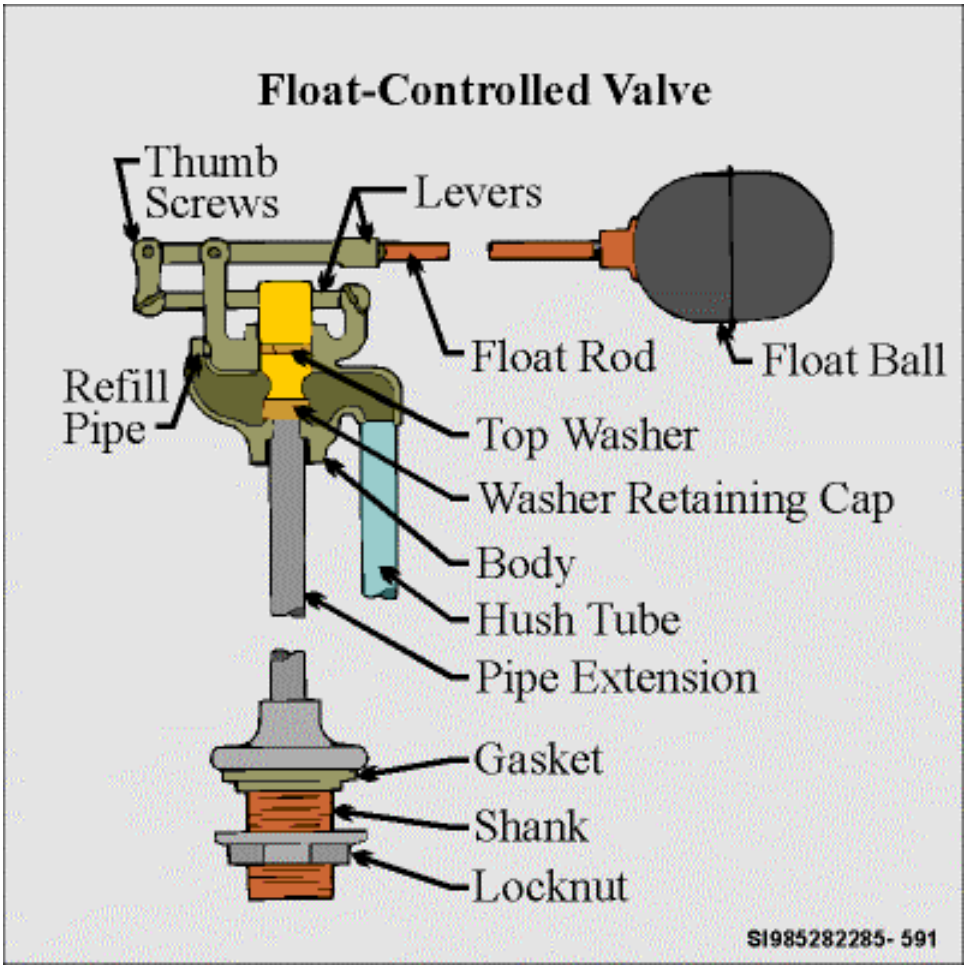


Figure 1, Float Controlled Valve

NOTE:
Douglas valve and Fluidmaster are two popular manufacturer name brands.

No matter what type of valve is used in a water closet, all will have a handle, trip lever, valve seat and an overflow tube. You will experience similar and dissimilar problems associated with different types of water closet valves, such as loose handles, lever adjustments, worn washers, and Cracked or broken float balls, and worn out flappers.

HINT:
Remember to follow manufacturer's recommendations or specifications

REPAIR OF WATER CLOSET COMPONENTS. (See Figure 2).

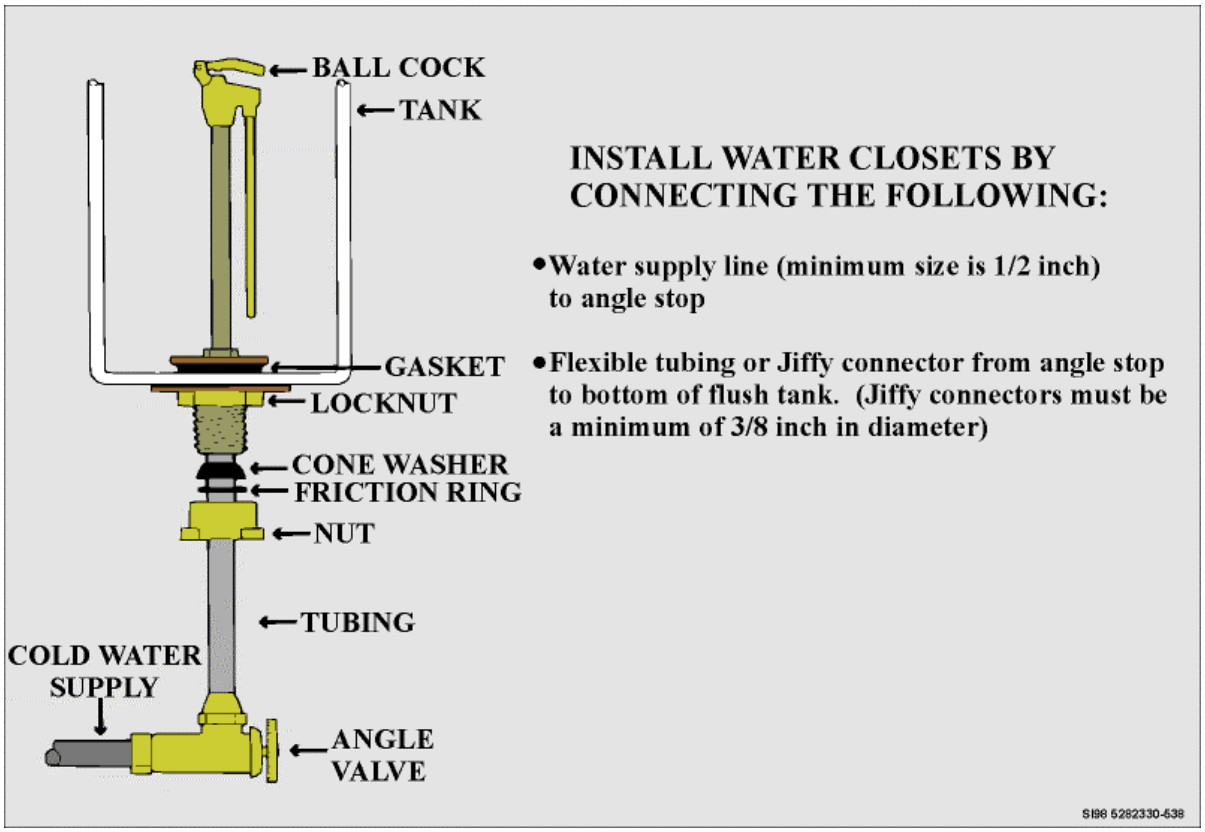


Figure 2, Ballcock Assembly

- **Traditional Plunger-valve and Diaphragm Ballcocks.** The water flow is controlled by a plunger attached to the float arm and ball. To lower the water level, bend the float arm down slightly. Raise the water level by bending the float arm up.
- **Float cup Ballcocks.** These are made of plastic. Lower and raise the water level by pinching the spring clip on the pull down rod and move it upward or downward.
- **Floatless Ballcocks.** These are controlled by a pressure sensing device. Lower and raise the level by adjusting the plastic screw clockwise or counter- clockwise.

HINT:
To save precious man-hours it may be feasible to replace water components (i.e. float valves, overflow tubes, lever assemblies, etc.) rather than trying to repair these components

Loose Or Broken Handles. Clean and adjust the handle so that it operates smoothly. If satisfactory results are not met, replace the handle.

Water continuously running could be caused by the chain being improperly adjusted,` a worn flapper valve, Debri lodged in the float valve, or the ballcock assembly top washer or plunger being worn out. (See Figure 3)

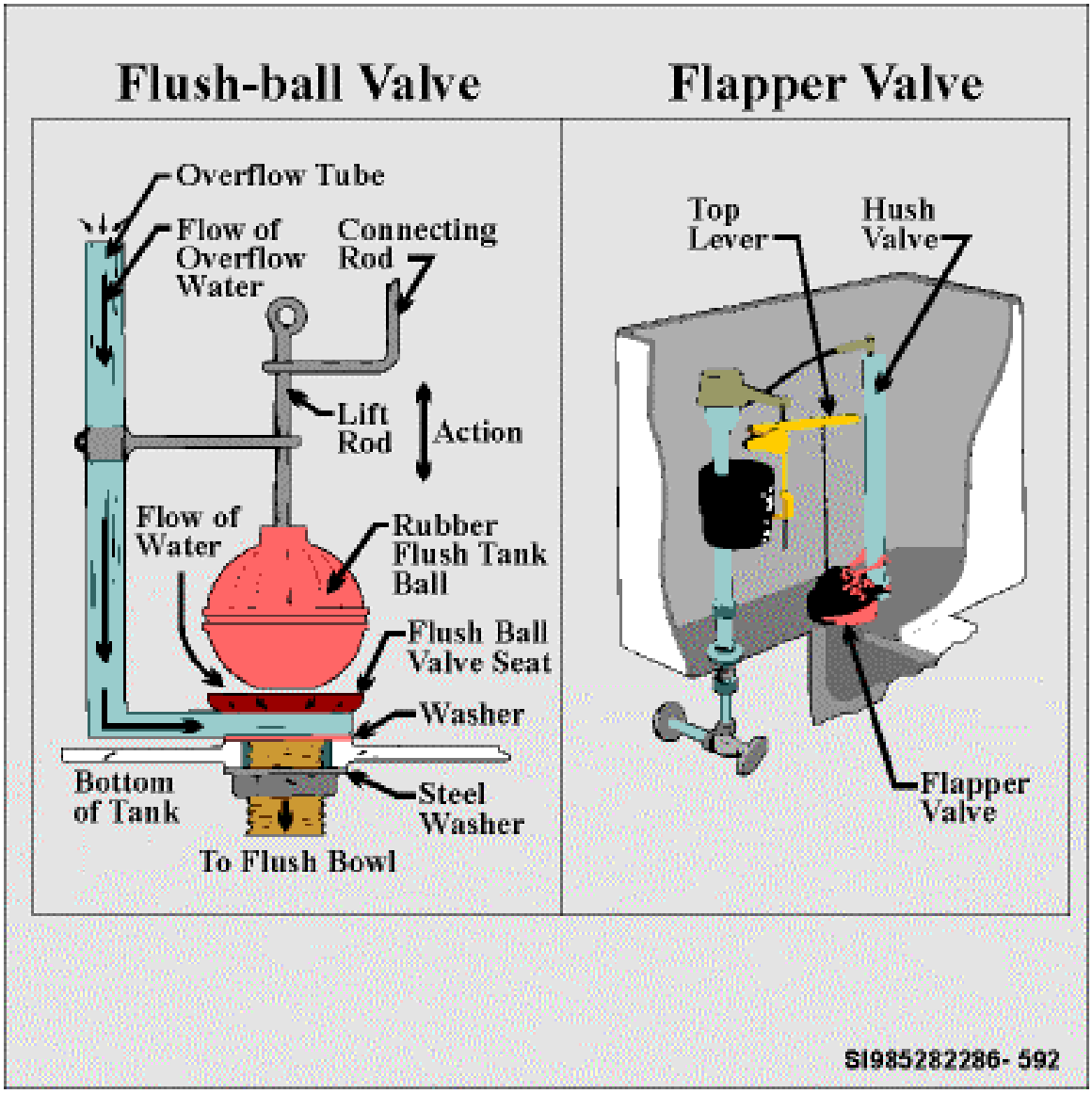


Figure 3, Sample of Water Closet Components

ADJUSTING LIFT CHAIN.

To perform this task, follow these steps:

Step 1: Adjust the lift chain so it hangs straight from the handle lever with about ½ inch of slack.

Step 2: Remove excess slack in the chain by hooking it in a different hole in the handle lever or by removing links.

Step 3: Adjust so the tank float operates smoothly.

Step 4: Inspect for proper operation.

Step 5: Clean up area and tools.

REPLACING THE FLAPPER VALVE>

To perform this task, follow these steps:

Step 1: Shut off the water supply

Step 2: Drain water from the tank of the water closet

Step 3: Remove the flapper valve. (use manufacturer's instructions)

Step 4: Install new flapper valve . (use manufacturer's instructions)

Step 5: Turn on supply and let the closet tank fill.

Step 6: Check for leaks and proper operation.

Step 7: Clean up area and tools.

REMOVING DEBRI IN THE BALLCOCK ASSEMBLY.

To perform this task, follow these steps:

Step 1: Shut off supply.

Step 2: Remove float ball and float rod from the ballcock assembly.

Step 3: Remove the top cover of the ballcock assembly.
- Remove screws and lift the cover off.

Step 4: Remove the top washer and plunger.

Step 5: Crack open angle valve to flush out debri.

Step 6: Reinstall top washer and cover.

Step 7: Reinstall float rod and float ball.

Step 8: Turn on supply and check for proper operation.

Step 9: Clean up area and tools.

REPLACING BALLCOCK ASSEMBLY WASHER AND PLUNGER.

To perform this task, follow these steps:

Step 1: Shut off supply.

Step 2: Remove float ball and float rod from the ballcock assembly.

Step 3: Remove the top cover of the ballcock assembly.

- Remove screws and lift the cover off.

Step 4: Remove top washer and plunger.

NOTE:
Always follow the manufacturer's instructions and use replacement parts from the manufacturer of the components you are working on.

Step 5: Inspect for wear or tears in the top washer.

Step 6: Inspect the plunger for deterioration.

Step 7: Replace with washer or plunger from the manufacturer's repair kit.

Step 8: Reinstall cover.

Step 9: Reinstall float rod and float ball.

Step 10: Turn on supply and check for proper operation.

Step 11: Clean up area and tools.

Worn cone washers normally cause leaks, which occur at the exterior of the tank. The two areas where worn cone washers may be found is at the exterior of the tank at the base of the ballcock assembly.

REPLACING CONE WASHERS.

To perform this task, follow these steps:

Step 1: Shut off supply.

Step 2: Drain the closet tank.

Step 3: Remove supply line from ballcock assembly.

Step 4: Remove lock nut using a smooth jaw wrench.

Step 5: Remove ballcock assembly.

Step 6: Remove and replace the cone washer. (Use replacement washer from manufacturer's repair kit)

Step 7: Reinstall lock nut.

Step 8: Reinstall supply line to ballcock assembly.

Step 9: Check for leaks and proper operation.

Step 10: Clean up area and tools.

Water leaking on the underside of the tank between the tank and the closet bowl could be caused by one of two things. The first is a worn doughnut gasket, and the second is a worn cone washer on the flush valve.

REPLACING DOUGHNUT GASKET/CONE WASHER ON THE FLUSH VALVE.

To perform this task, follow these steps:

Step 1: Clean up area and tools.

Step 2: Drain the closet tank.

Step 3: Remove tank bolts.

Step 4: Remove tank from closet bowl.

Step 5: Remove doughnut gasket and inspect for wear.

- If it is worn replace with gasket from manufacturer's repair kit.

Step 6: Remove lock nut from flush valve.

Step 7: Remove flush valve.

Step 8: Inspect flush valve cone washer.

- If it is worn replace with cone washer from manufacturer's repair kit.

Step 9: Reassemble components in reverse order.

Step 10: Turn on supply.

Step 11: Check for leaks and proper operation.

Step 12: Clean up area and tools.

Review Questions
for
Water Closet Components

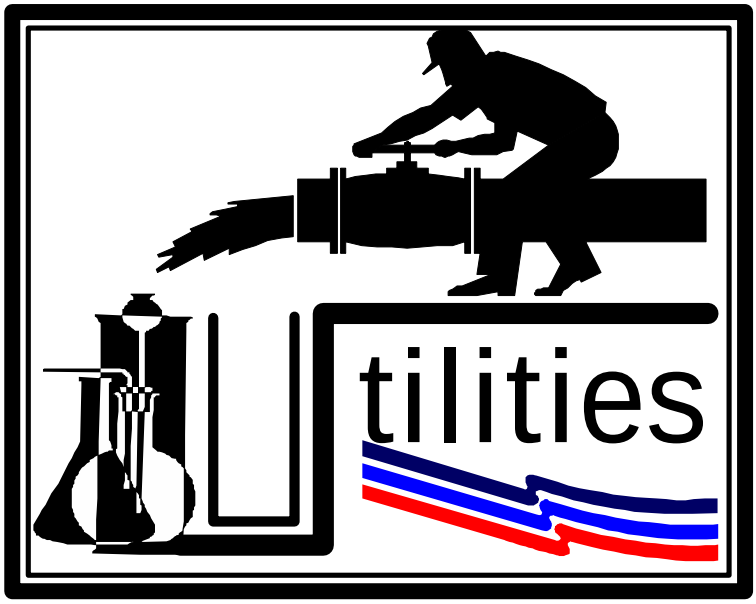
Question	Answer
1. What other names are float controlled valves known by?	a. Float valves/ballcocks b. Check/Gate c. Pressure/lift d. All of the above
2. What must you follow when repairing water closet components?	a. Plumber's Journal b. Common sense c. Manufacturer's instructions d. All of the Above
3. What closet tank component could cause a leak between the closet tank and the bowl?	a. Doughnut gasket b. Seal c. Cone washer d. Both a and c
4. How much slack should be left on the lift chain?	a. ¼' b. ½" c. ¾" d. 1"

WATER CLOSET COMPONENTS

Performance Checklist		
Step	**Yes**	**No**
1. Did Trainee correctly identify all water closet components?		
2. Did the trainee adjust flushing levers, and chain levers following the steps in the QTP? • Adjust the lift chain so it hangs straight from the handle lever with about ½ inch of slack • Remove excess slack in the chain by hooking it in a different hole in the handle lever or by removing links • Adjust so the tank float operates smoothly • Inspect for proper operation • Clean up area and tools		
3. Did the trainee replace the flapper valve following the steps in the QTP? • Shut off the water supply • Drain water from the tank of the water closet • Remove the flapper valve • Install new flapper valve • Turn on supply an let the closet tank fill • Check for leaks and proper operation • Clean up area and tools		
4. Did the trainee remove debri in the ballcock assembly following the steps in the QTP? • Shut off supply • Remove float ball and float rod from the ballcock assembly • Remove the top cover of the ballcock assembly • Remove the top washer and plunger • Crack open angle valve to flush out debri • Reinstall top washer and cover • Reinstall float rod and float ball • Turn on supply and check for proper operation • Clean up area and tools		
5. Did the trainee replace the ballcock assembly washer and plunger following the steps in the QTP? • Shut off supply • Remove float ball and float rod from the ballcock assembly • Remove the top cover of the ballcock assembly • Remove top washer and plunger • Inspect for wear or tears in the top washer • Inspect the plunger for deterioration • Replace with washer or plunger from the manufacturer's repair kit • Reinstall cover • Reinstall float rod and float ball • Turn on supply and check for proper operation		

• Clean up area and tools		
6. Did the trainee replace the cone washer following the steps in the QTP? • Shut off supply • Drain the closet tank • Remove supply line from ballcock assembly • Remove lock nut using a smooth jaw wrench • Remove ballcock assembly • Remove and replace the cone washer • Reinstall lock nut • Reinstall supply line to ballcock assembly • Check for leaks and proper operation • Clean up area and tools		
7. Did the trainee replace the doughnut gasket and cone washer following the steps in the QTP? • Clean up area and tools • Drain the closet tank • Remove tank bolts • Remove tank from closet bowl • Remove doughnut gasket and inspect for wear • Remove lock nut from flush valve • Remove flush valve • Inspect flush valve cone washer • Reassemble components in reverse order • Turn on supply • Check for leaks and proper operation • Clean up area and tools		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



REPAIR

MODULE 22 AFQTP UNIT 2

TRAPS (22.2.2.)

TRAPS

Task Training Guide

STS Reference Number/Title:	22.2.2., Traps
Training References:	• Uniform Plumbing Code • CDC 3E451 • Study Guide/Workbook J3ABR3E431 • AFJMANs 32-1070
Prerequisites:	• Possess as a minimum a 3E431 AFSC.
Equipment/Tools Required:	• General plumbing hand tools • P-trap • Slip nuts • Slip joint washers
Learning Objective:	• Trainee will repair a trap
Samples of Behavior:	• Trainee will understand the procedures to repair traps
Notes:	

TRAPS

Background: One of the basic principles of plumbing is that every plumbing fixture must have a trap. The trap is a fitting designed to provide a liquid seal. This liquid seal will prevent sewer gases from entering the building.

There are two types of traps, the P-trap and the S-trap. The most commonly used trap is the P-trap. Other type of traps are drum traps, bell traps, bottle traps and bag traps. The material used to construct these traps will vary, from plastic to cast-iron. **We will discuss the repair and replacement of the most common used trap, the P-trap.**

P-Trap. There are two different types of P-traps: the common seal and the deep seal (*which holds twice the column of water, or 4 or more inches than the common seal*). Both types of P-traps require the same type of repairs. See Figure 1, Classification of Traps

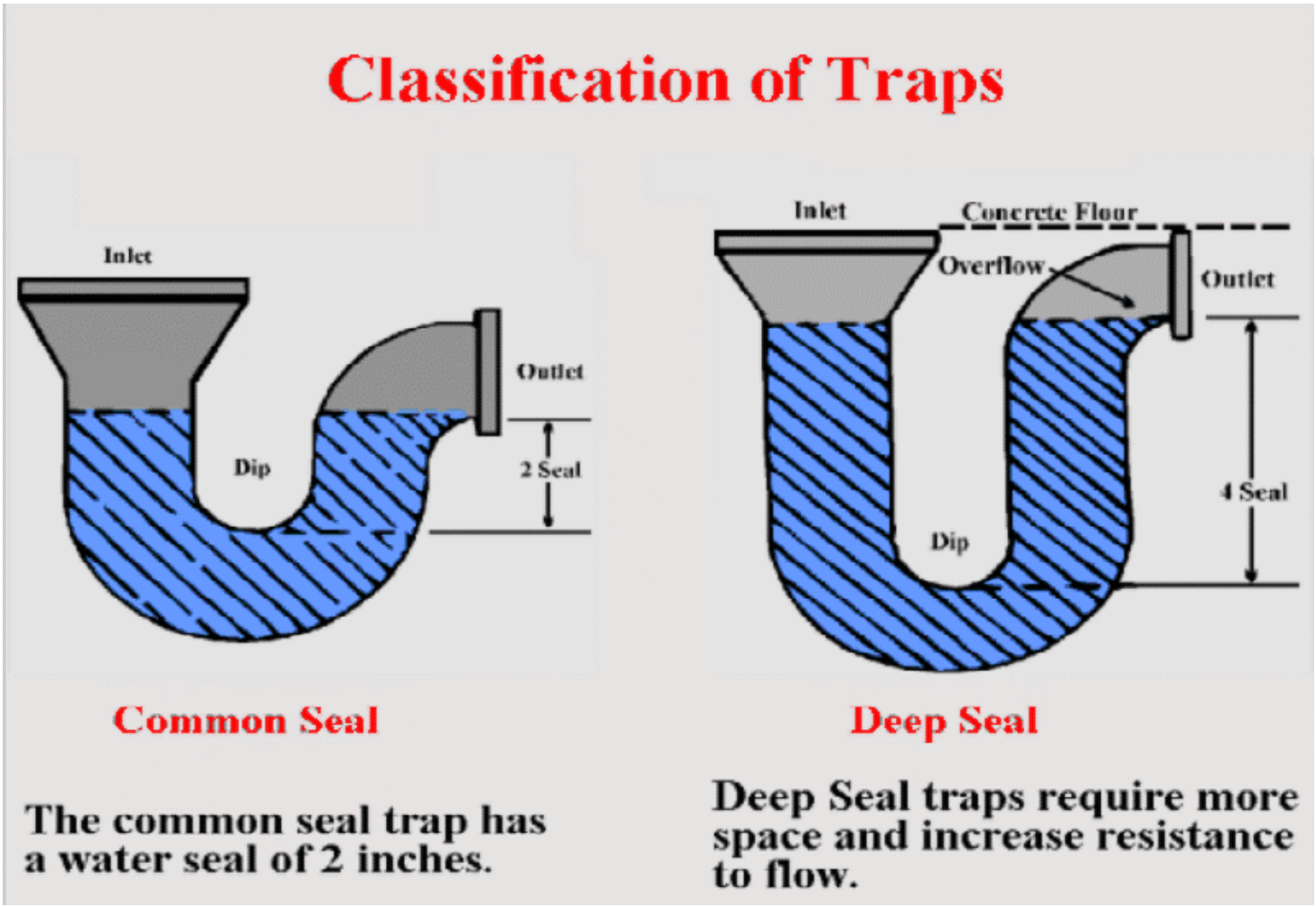


Figure 1, Classification of Traps

To perform this task, follow these steps:

Step 1: Gather required tools.

HINT:
If the trap is under a lavatory, a small pail or some type of receptacle should be used to catch the remaining water when disassembling.

Step 2: Disassemble the Slip joints.

- Most P-traps are made with a chrome finish.
- Use a Ford (monkey) Wrench to tighten or loosen the slip nut.

Step 3: Inspect slip nut and slip joint washer.

- If threads are damaged, replace it.
- If the slip joint washer is damaged replace it.

Step 4: Inspect the P-trap threads.

- If the threads are damaged, replace it.

Step 5: Inspect trap for cracks and obstructions.

- Remove obstructions or replace trap if cracked or damaged.

Step 6: Reinstall slip joint washers and slip nuts.

HINT:
Some slip joints require only to be hand tightened

Step 7: Turn on supply to fixture.

Step 8: Inspect for leaks.

- If there is a leak, tighten the coupling until it stops. If this fails, check the tapered washer and the threads on the P-trap.

Step 9: Clean work area and put tools back in their proper place.

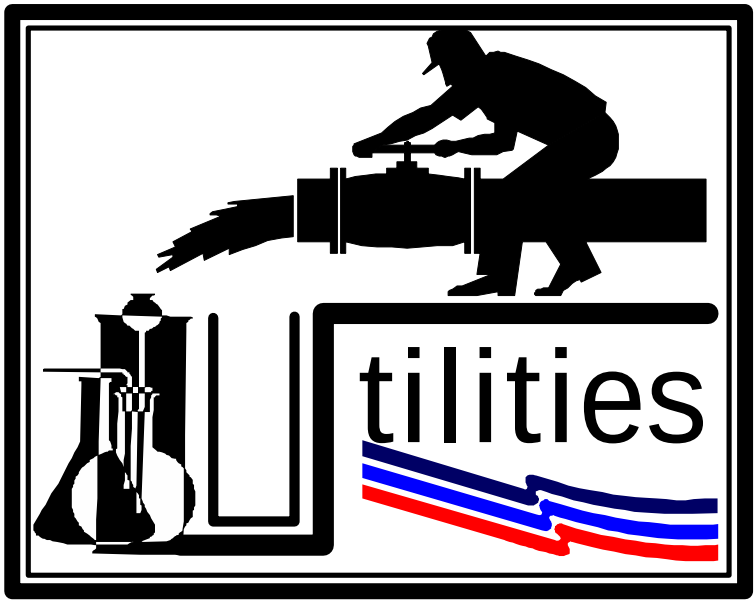
Review Questions
for
Traps

Question	Answer
1. What must every plumbing fixture with a drain have?	a. A valve b. A stopper c. A trap d. All of the above
2. What is the basic function of a trap?	a. Create a smooth flow of solid waste b. Prevent sewer gases from entering building c. Catch items that fall down the drain d. Collect hair and other debris
3. Another function of a trap is to catch or retain items that may fall into a fixture.	a. True b. False
4. A trap is a fitting or device so designed and constructed as to provide, when properly vented, a liquid seal, which prevents sewer gases from entering the building.	a. True b. False

TRAPS

Performance Checklist		
Step	**Yes**	**No**
1. Did the trainee identify all the equipment needed for the job?		
2. Did the trainee repair traps? • Gather required tools. • Disassemble the Slip joints. • Inspect slip nut and slip joint washers. • Inspect P-trap threads. • Inspect trap for cracks and obstructions. • Reinstall slip nut and slip joint washers. • Turn on supply to fixture. • Inspect for leaks. • Clean work area and put tools back in their proper place.		
3. Did the trainee understand the procedures to repair traps?		
4. Did the trainee complete all the questions in the QTP? • Score 80% or higher • Did the trainer review and explain all missed questions?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



REPAIR

MODULE 22 AFQTP UNIT 2

FAUCETS (22.2.3.)

FAUCETS

Task Training Guide

STS Reference Number/Title:	22.2.3., Faucets
Training References:	• Study Guide/Workbook J3ABR3E431 • CDC 3E451
Prerequisites:	• Possess as a minimum a 3E431 AFSC.
Equipment/Tools Required:	• Repair kit • Basic plumbers toolbox • Seat wrench • Seat kit • Washer kit • O-ring kit
Learning Objective:	• Trainee will learn to repair water faucet
Samples of Behavior:	• Trainee will be able to repair water faucet to include check for leaks and proper operation
Notes:	
• Steps will be followed in sequence as needed • Any safety violation is an automatic failure	

FAUCETS

Background: There are generally two categories of faucets: individual and combination. Those that have a common spout are called mixing faucets. A basic type of faucet has the seat and a washer (disc) which is located at the end of the stem. The stem packing is held into place by a packing nut. Most faucets today have a stem assembly allowing the stem to turn inside a replaceable threaded sleeve. By using this type of faucet, you eliminate stem wear on the body of the valve. Leakage from the spout when the water is turned off is an indicator that either the washer or seat is bad. If water is leaking around the stem of the faucet this is an indicator that the packing nut needs to be tightened.

NOTE:
Always read the manufacturer's specifications regarding repair of the kind of faucet you will be working on.

REPAIRING FAUCETS. (See Figure 1).

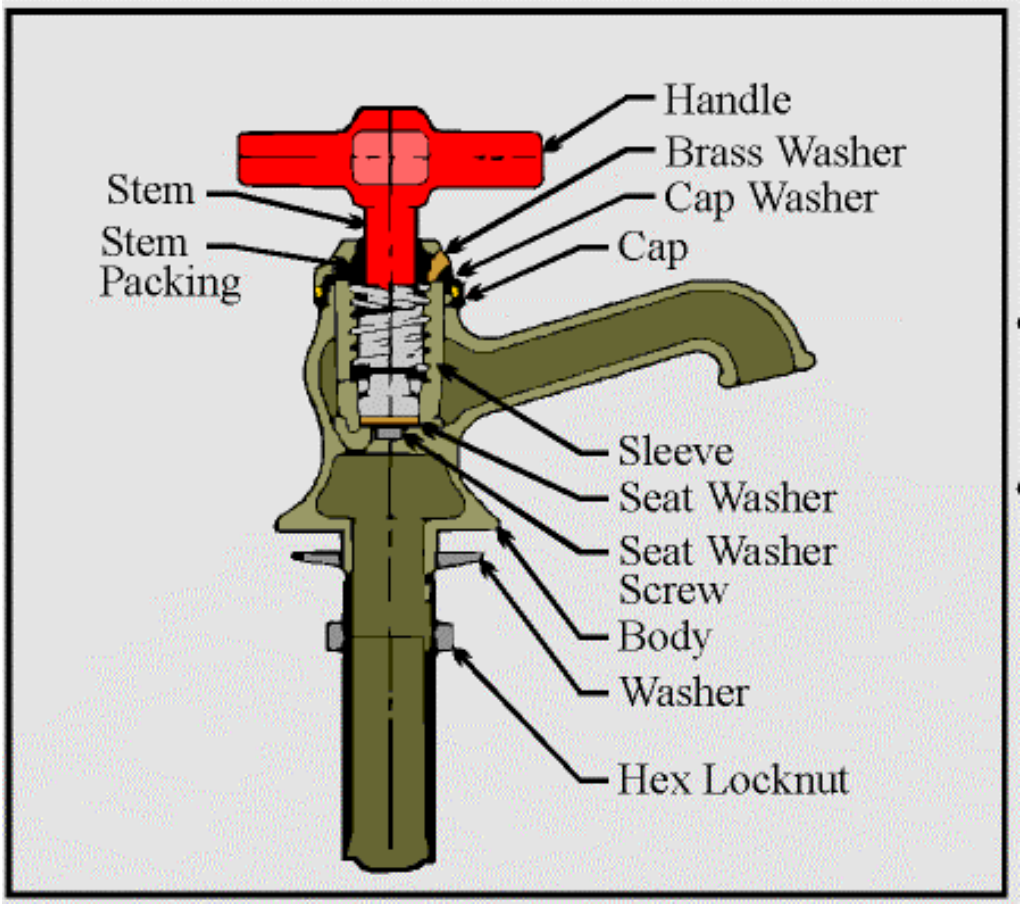


Figure 1, Faucet Components.

REPAIRING FAUCETS.

To perform the repairs, follow these steps.

Step 1: Turn off supply at the angle stop.

- Open the faucet one quarter turn.

Step 2: Remove the cap from top of faucet handle and remove the screw.

Step 3: Remove handle.

- A handle puller may be necessary to remove handle if it is hard to remove.

Step 4: Unscrew the stem assembly from the body of faucet using an adjustable jaw wrench.

Step 5: Inspect the valve seat in faucet body for wear.

HINT:
Some seats are not removable, in this case you would need to use a reseating tool. (See Figure 2)

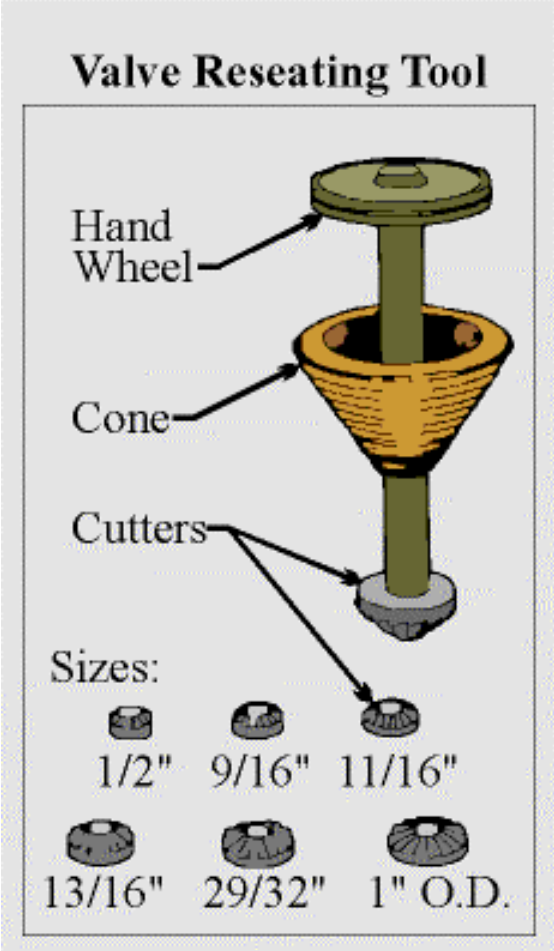


Figure 2, Reseating Tool

Step 6: To replace the seat insert proper seat wrench into the seat, and turn it counter-clockwise to remove seat.

NOTE:
If a replacement seat is not on hand, you can smooth seat by sanding. Sanding may only last for a short time, remember to replace seat later when new seat comes in.

Step 7: Install replacement seat.

- Ensure the replacement seat is an accurate match.

Step 8: Inspect the stem washer (disc)

Step 9: Remove the screw from the stem assembly.

Step 10: Remove the worn stem washer (disc).

Step 11: Install replacement stem washer (disc).

Step 12: Unscrew the stem from the threaded sleeve.

Step 13: Inspect the O-ring and ensure it is in good repair.

Step 14: If the O-ring is bad remove it and replace with same size O-ring.

Step 15: Reassemble the faucet in reverse order.

Step 16: Turn on water supply and check for proper operation.

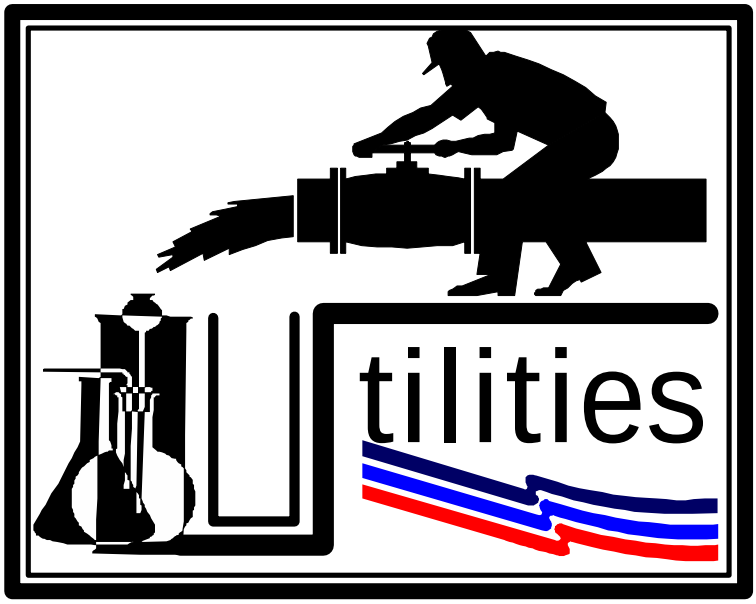
Review Questions for Faucets

Question	Answer
1. Which of the following is not a category of faucet?	a. Individual b. Mixing c. Combination d. Fixed
2. You don't really need to inspect the valve seat in the faucet body.	a. True b. False
3. What may be needed to pull off the faucet handle?	a. Handle puller b. Packing puller c. Strap wrench d. Pliers
4. If seat is worn and can't be removed what should you do?	a. Resurface seat with a reseating tool b. Resurface seat with a rasp file c. Resurface seat with wire brush d. Replace the entire unit
5. When replacing a seat or O-ring what should you ensure?	a. Try a rubber band this time b. Use correct replacement part c. You never replace an O-ring d. None of the above

FAUCETS

Performance Checklist		
Step	**Yes**	**No**
1. Did trainee identify all the equipment needed for the job? • Seat Wrench • Reseating Tool • Replacement parts • Tools		
2. Did the trainee take proper safety precautions?		
3. Did the trainee repair the faucet following the QTP and using manufacturer's specifications? • Turn off supply at the angle stop. • Remove the cap from top of faucet handle and remove the screw. • Remove handle. • Unscrew the stem assembly from the body of faucet. • Inspect the valve seat. • Remove seat. • Replace the seat. • Inspect stem washer (disc). • Remove screw. • Remove and replace stem washer (disc). • Unscrew the stem from the threaded sleeve • Inspect O-ring. • Replace O-ring. • Reassemble faucet in reverse order. • Turn on supply and check for proper operation.		
4. Did the trainee use exact duplicate parts?		
5. Did the trainee check for leaks and proper operation?		
6. Did the trainee complete all the questions in QTP? • Score 80% or higher • Did the trainer review and explain all missed questions?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



REPAIR

MODULE 22 AFQTP UNIT 2

MIXING VALVES (22.2.4.)

MIXING VALVES

Task Training Guide

STS Reference Number/Title:	22.2.4., Mixing Valves
Training References:	• CDC 3E451 • Study Guide/Workbook J3ABR3E431 • AFJMANs 32-1070 • Uniform Plumbing Code
Prerequisites:	• Possess as a minimum a 3E431 AFSC.
Equipment/Tools Required:	• Basic plumbing tool kit • Handle puller • Shower stem socket wrench • Seat wrench • Seat kit • Washer kit • O-ring kit
Learning Objective:	• Trainee will learn to repair mixing valves
Samples of Behavior:	• Trainee will be able to repair mixing valves
Notes:	
• Steps will be followed in sequence as needed • Any safety violation is an automatic failure	

MIXING VALVES

Background: There are three basic types of mixing valves used in showers and tub and shower combinations. The first type is the manual mixing valve, it consists of two hand-operated valves in one valve body. The manual mixing valve does not give any protection against sudden changes in temperature caused by varying temperature or supply pressure fluctuations. The second type of mixing valve is the pressure controlled mixing valve. This type of mixing valve has one handle that controls both hot and cold water and protects against pressure changes in the system. The last type of valve is the thermostatic mixing valve. This type of mixing valve protects against varying water temperatures and supply pressure fluctuations.

There are many types of repair kits available, be sure to use a repair kit that is made by the manufacturer of the mixing valve you are working on. Also be sure to follow the manufacturer's instructions.

REPAIRING A MIXING VALVE.

To perform this task, follow these steps:

Step 1: Identify the type of mixing valve you will be repairing.

Step 2: Get manufacturer's instructions and parts breakdown for the type of mixing valve you will be repairing.

Step 3: Get proper repair kits (O-ring, washer, and seat kits)

Step 4: Shut off supply.

Step 5: Remove screw on the handle.

Step 6: Pull handle off.
- If the handle is hard to remove use a handle puller.

Step 7: Remove the escutcheon.
- Some escutcheons are threaded on and have to be unthreaded to remove.

Step 8: Remove Stem assembly.
- Use a shower stem socket wrench and turn it counterclockwise until the stem comes out.

Step 9: Inspect the stem washer (disc) if it is worn replace it.
- To replace the discs remove the screw and pull the disc off.
- Reinstall replacement washer from the washer kit and reinstall the screw.

Step 10: Inspect the seat inside the valve assembly if pitted replace it.

- If the valve has a removable seat extract it (use a seat wrench).
- Replace the seat with a new one from the seat kit (use seat wrench).

Step 11: Reassemble the valve in reverse order.

Step 12: Install the escutcheons.

Step 13: Install handles.

Step 14: Turn on water supply.

Step15: Check for leaks.

Step 16: Clean up the area and put up tools.

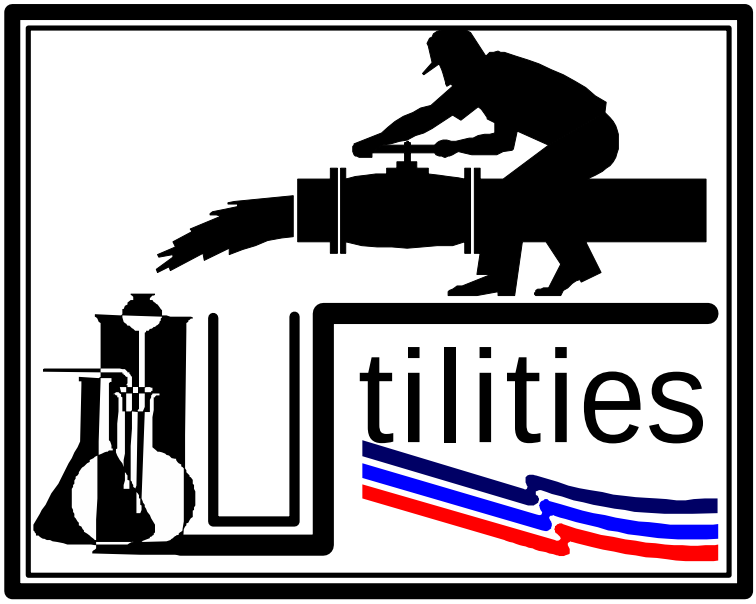
Review Questions
for
Mixing Valves

Question	Answer
1. What must you refer prior to repairing a mixing valve?	a. Manufacturer's instructions b. CDCs c. Plumber's Journal d. Any of the above
2. Why should you refer to the manufacturer's instruction's when repairing a mixing valve?	a. It's the law b. For safety reasons c. Different manufacturer's d. Non of the above
3. What is the last thing you do when all repairs have been made?	a. Check for leaks and proper operation b. Turn on water and watch for filings c. Turn on water and taste for palatability d. turn on water and taste for potability
4. Which of the following is not a type of mixing valve?	a. Thermostatic b. Fixed c. Manual d. Pressure

MIXING VALVES

Performance Checklist		
Step	**Yes**	**No**
1. Did trainee identify all the equipment needed for the job? • Basic plumbing tool kit • Handle puller Shower stem socket wrench • Shower stem socket wrench • Seat wrench • Seat kit • Washer kit • O-ring kit		
2. Did the trainee take proper safety precautions?		
3. Did the trainee repair the mixing valve following the QTP and using manufacturer's specifications? • Identify the type of mixing valve you will be repairing • Get manufacturer's instructions and parts breakdown • Get proper repair kits (O-ring, washer, and seat kits) • Shut off supply • Remove screw on the handle • Pull handle off • Remove the escutcheon • Remove Stem assembly • Inspect the stem washer (disc) if it is worn replace it. • Inspect the seat inside the valve assembly if pitted replace it. • Reassemble the valve in reverse order • Install the escutcheons • Install handles • Turn on water supply • Check for leaks • Clean up the area and put up tools		
4. Did the trainee complete all the questions in QTP? • Score 80% or higher • Did the trainer review and explain all missed questions?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



REPAIR

MODULE 22 AFQTP UNIT 2

FLUSHOMETERS (22.2.5.)

FLUSHOMETERS

Task Training Guide

STS Reference Number/Title:	22.2.5., Flushometers
Training References:	• CDC 3E451 • Study Guide/Workbook J3ABR3E431 • AFJMANs 32-1070 • Uniform Plumbing Code
Prerequisites:	• Possess as a minimum a 3E431 AFSC.
Equipment/Tools Required:	• Repair kits • Plumbing tool kit.
Learning Objective:	• Trainee will learn to repair/replace a flushometer
Samples of Behavior:	• Trainee will be able to repair a flushometer
Notes:	
• Steps will be followed in sequence as needed • Any safety violation is an automatic failure	

FLUSHOMETERS

Background: Depending on the make of a urinal or water closet, flushometers will vary in type and size, but rarely in the principle of operation.. There are two types of flushometers, the piston type and the diaphragm type. The two types of fixtures that flushometers serve are closet bowls and urinals.

The **piston** type flushometer has a hollow piston that separates the water in the dashpot chamber from the lower chamber. When the handle is activated the water is discharged from the dashpot chamber. The difference in pressure between the dashpot and the lower chambers forces the piston assembly upward allowing the water to enter the fixture. The dashpot chamber is filled through a bypass in the piston. The bypass is connected to the water supply. When the water pressure equalizes on both sides of the piston, the piston will seat, closing off the water supply. (See Figure 1)

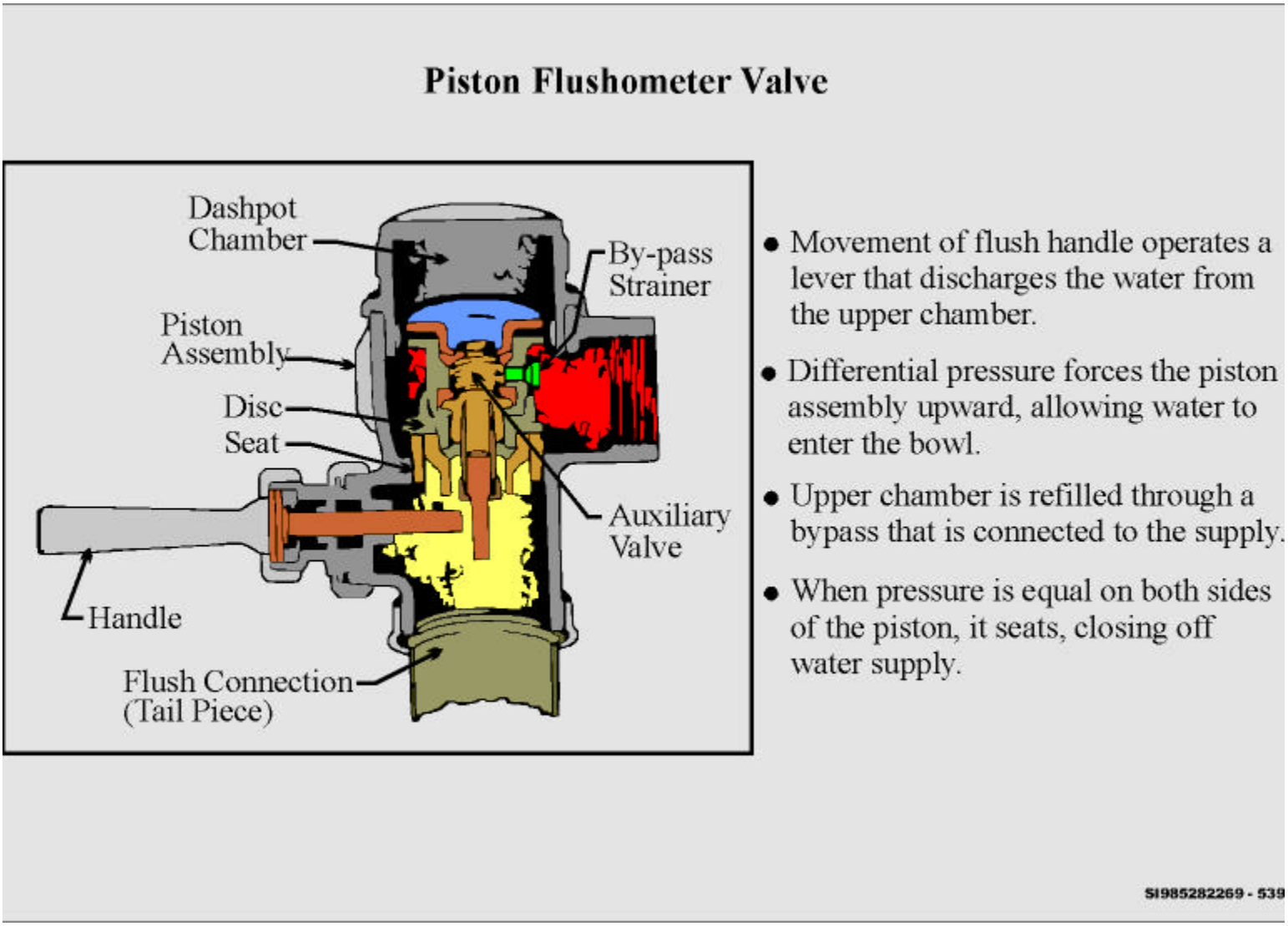


Figure 1, Piston Type Flushometer

The diaphragm type flushometer uses a flat rubber diaphragm. It has an upper and a lower chamber, which is separated by a relief valve mounted on the diaphragm. The upper chamber is connected to the lower chamber by a bypass. The lower chamber is connected to a ¾ inch angle valve on the supply line. When the handle is activated the relief valve is moved to the open position discharging the water from the upper chamber. The difference in pressure between the upper and lower chambers forces the diaphragm to lift off its seat admitting water from the supply into the fixture. Water then fills the upper chamber through the bypass line. When the pressure equalizes the diaphragm will seat closing off the water flow. (See Figure 2)

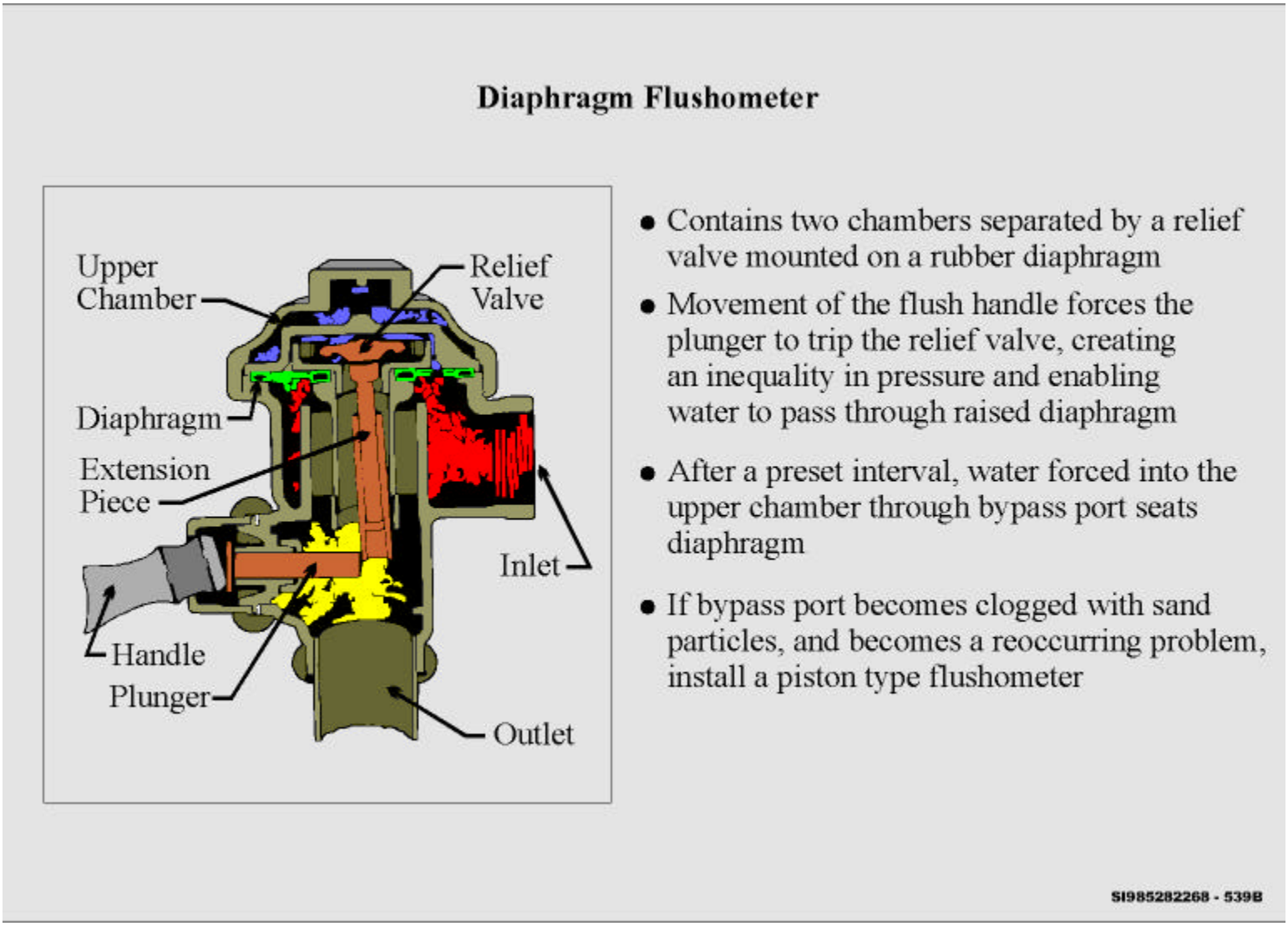


Figure 2, Diaphragm Type Flushometer

NOTE:
If available, the manufacturer's instructions must be followed for the flushometer you're working on.

REPAIRING A FLUSHOMETER. (See Figure)

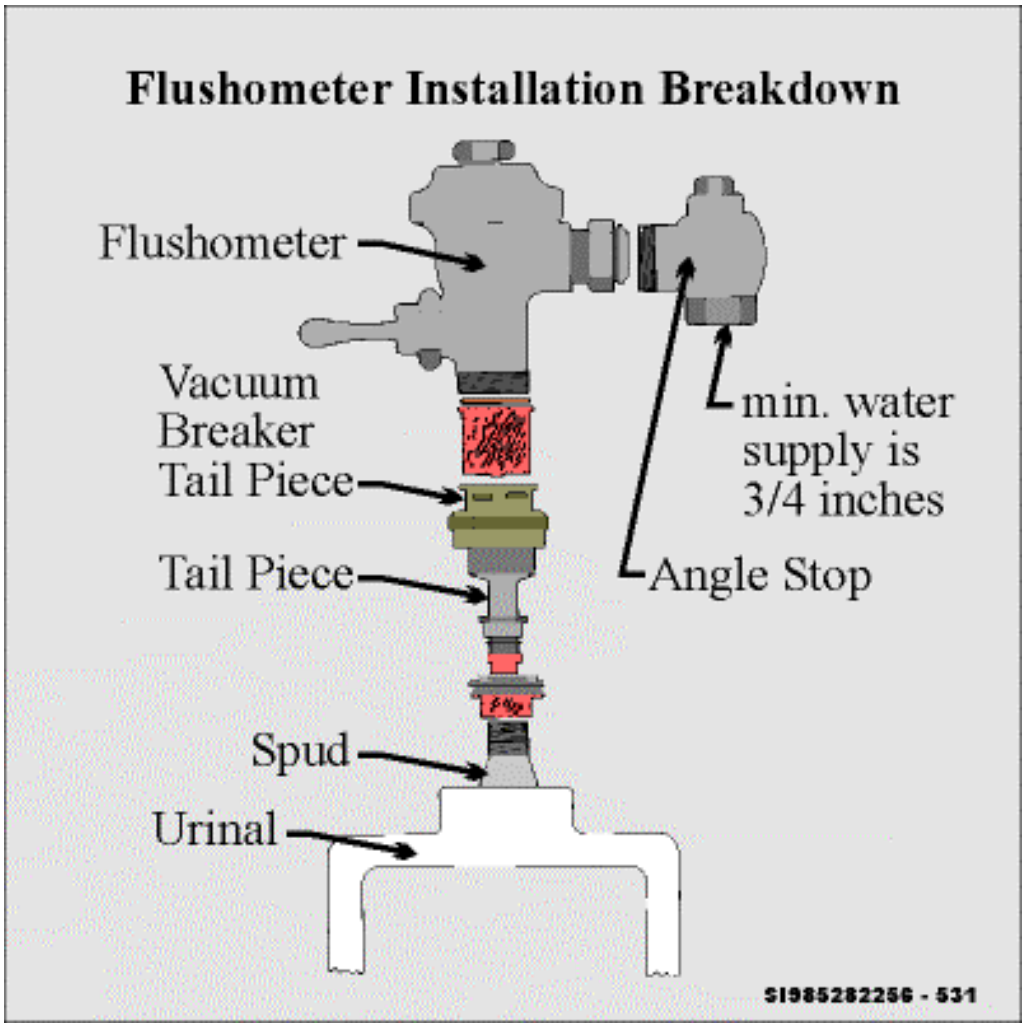


Figure 3, Flushometer Breakdown.

REPAIRING A FLUSHOMETER.

To perform replacement, follow these steps:

Step 1: Identify the type of flushometer you will be replacing.

Step 2: Obtain manufacturer's instructions and parts breakdown.

Step 3: Shut off the water supply (usually at the angle valve).

Step 4: Remove the lid or cover of the flushometer.

Step 5: Inspect the diaphragm/piston bypass line to ensure it's not restricted.

- If it is restricted use a piece of wire to remove the obstruction.

Step 6: Inspect seating surfaces and clean any debri.

NOTE:
Debri can cause flushometers to malfunction or become inoperable. The flushometer should be cleaned thoroughly when disassembled.

Step 7: Inspect for worn parts and replace if needed.

Step 8: Inspect the handle of the flushometer for wear and replace if necessary.

Step 9: Remove the tailpiece slip nut.

Step 10: Remove the tailpiece from the flushometer.

Step 11: Inspect vacuum breaker for wear. Remove and replace if necessary.

Step 12: Inspect o-ring in the flushometer for wear. Remove and replace if necessary.

Step 13: Reassemble flushometer in reverse order.

Step 14: Turn on supply at angle valve.

Step 15: Check for leaks and proper operation.

Step 16: Clean up area and put up tools.

Review Questions for Flushometers

Question	Answer
1. If available what must you refer to in the repairs of a flushometer?	a. Manufacturer's instructions b. CDCs c. Plumber's Journal d. Any of the above
2. Where do you normally turn off the water supply going to a flushometer?	a. At the globe valve b. At the gate valve c. At the angle valve d. At the building main
3. What is the last thing you do when all repairs have been made?	a. Check for leaks and proper operation b. Turn on water check for floating debris c. Tighten an extra turn to prevent leakage d. All of the above
4. How does water enter the dashpot chamber on the piston type flushometer?	a. Control line b. Sensing line c. Bypass line d. Tail line

FLUSHOMETERS

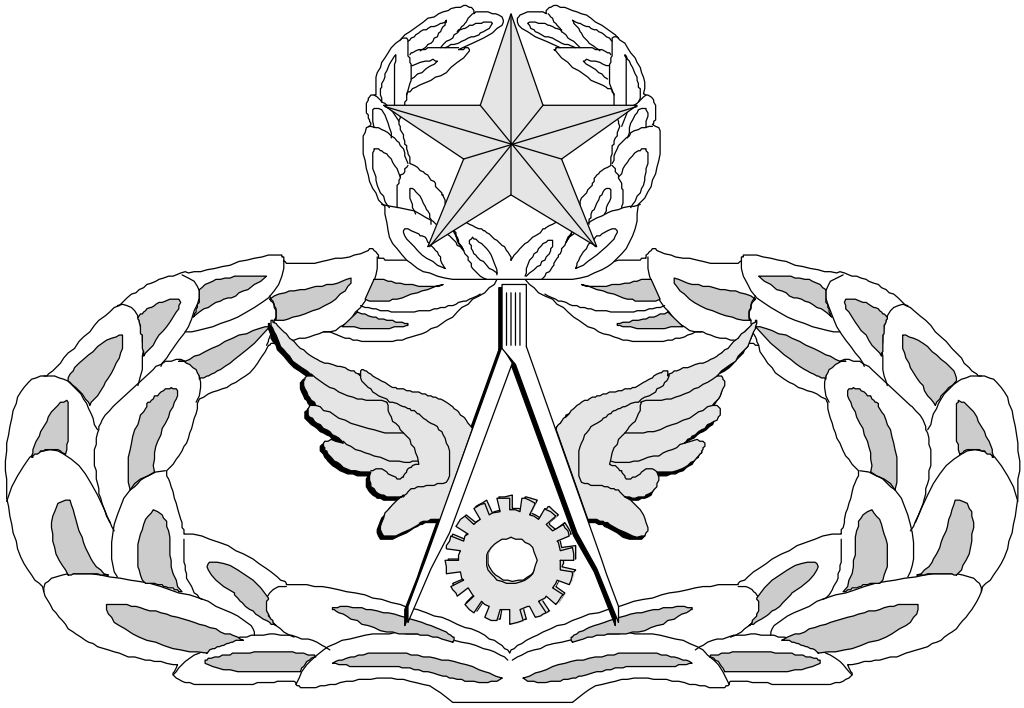
Performance Checklist		
Step	**Yes**	**No**
1. Did trainee identify all the equipment needed for the job?		
2. Did the trainee take proper safety precautions?		
3. Did the trainee repair the flushometer following the steps using the QTP and referring to the manufacturer's instructions? • Identify the type of flushometer you will be replacing • Obtain manufacturer's instructions and parts breakdown • Shut off the water supply • Remove the lid • Inspect the diaphragm/piston bypass line • Inspect for worn parts and replace if needed • Inspect the handle of the flushometer • Remove the tailpiece slip nut • Remove the tailpiece from the flushometer • Inspect vacuum breaker for wear • Inspect o-ring in the flushometer for wear • Reassemble flushometer in reverse order. • Turn on supply at angle valve • Check for leaks and proper operation • Clean up area and put up tools		
4. Did the trainee use manufacturer's instructions if available?		
5. Did the trainee complete all the questions in QTP? • Score 80% or higher • Did the trainer review and explain all missed questions?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Air Force Civil Engineer

QUALIFICATION TRAINING PACKAGE (QTP)

REVIEW ANSWER KEY



For

UTILITIES SYSTEMS

(3E4X1)

MODULE 22

FIXTURES AND RELATED COMPONENTS

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

LAVATORIES

(3E4X1-22.1.1.)

Question	Answer
1. What should you follow when before installing a lavatory?	c. Manufacturer's Specifications
2. Which lavatory is secured by retaining clips.	a. Countertop
3. 1 ½ inch is the minimum size for a lavatory drain .	a. True
4. Which lavatory contains an "S"-trap?	b. Pedestal
5. What is the minimum height of a wall hung lavatory?	a. 31 inches

WATER CLOSETS

(3E4X1-22.1.2.)

Question	Answer
1. What two kinds of water closets are there?	a. Wall-hung and floor mounted
2. Which is the most commonly used water closet on Air Force installations?	a. Floor mounted
3. What should you always refer to when installing a water closet?	c. Manufactures specifications
4. What may be needed if the floor has been raised above the top of the closet flange?	b. A second wax ring
5. How do you seal the wax ring to the flange?	a. Rock closet bowl gently
6. Why should you never over tighten nuts on a bowl?	c. The water closet will crack
7. Where do you hook up the water supply?	b. To the ballcock assembly

URINALS

(3E4X1-22.1.3.)

Question	Answer
1. What is the minimum size drain line that can used for urinals?	b. 2”
2. What is the lip height of a wall hung urinal?	b. 20-25”
3. What is the minimum size p-trap that can be installed on a urinal ?	a. 1-½”
4. What should be used in all installations ?	a. Manufacturer’s specifications

SHOWERS

(3E4X1-22.1.4.)

Question	Answer
1. What is the minimum size drain for a single shower?	b. 2”
2. What is the minimum size drain for a gang shower?	c. 3”
3. The shower pan must extend at least 3 inches above the finished floor.	a. True
4. What will happen if the shower pan is not supported properly?	c. It could leak
5. What should be done before installing dry wall?	d. Both b and c

FAUCETS

(3E4X1-22.1.7.)

Question	Answer
1. What should you always refer to when installing a faucet?	b. Manufacturer's specifications
2. What size bead of putty do you apply to the base of the faucet?	a. ¼"
3. Why do you press the faucet down firmly to the sink?	a. To ensure a tight seal
4. After installation of faucets what should be done?	d. Check for leaks

WATER CLOSET COMPONENTS

(3E4X1-22.2.1.)

Question	Answer
1. What other names are float controlled valves known by?	a. float valves/ballcocks
2. What must you follow when repairing water closet components?	c. Manufacturer's instructions
3. What closet tank component could cause a leak between the closet tank and the bowl?	d. Both a and c
4. How much slack should be left on the lift chain?	b. ½"

TRAPS

(3E4X1-22.2.2.)

Question	Answer
1. What must every plumbing fixture with a drain have?	c. A trap
2. What is the basic function of a trap?	b. Prevent sewer gases from entering building
3. Another function of a trap is to catch or retain items that may fall into a fixture.	b. False
4. A trap is a fitting or device so designed and constructed as to provide, when properly vented, a liquid seal, which prevents sewer gases from entering the building.	a. True

FAUCETS

(3E4X1-22.2.3.)

Question	Answer
1. Which of the following is not a category of faucet?	d. Fixed
2. You don't really need to inspect the valve seat in the faucet body.	b. False
3. What may be needed to pull off the faucet handle?	a. Handle puller
4. If seat is worn and can't be removed what should you do?	a. Resurface seat with a reseating tool
5. When replacing a seat or O-ring what should you ensure?	b. Use correct replacement part

MIXING VALVES

(3E4X1-22.2.4.)

Question	Answer
1. What must you refer to in the repairs of a mixing valve?	a. Manufacturer's instructions
2. Why should you refer to the manufacturer's instruction's when repairing a mixing valve?	c. Different manufacturer's
3. What is the last thing you do when all repairs have been made?	a. Check for leaks and proper operation
4. Which of the following is not a type of mixing valve.	b. Fixed

FLUSHOMETERS

(3E4X1-22.2.5.)

Question	Answer
1. If available what must you refer to in the repairs of a flushometer?	a. Manufacturer's instructions
2. Where do you normally turn off the water supply going to a flushometer?	c. At the angle valve
3. What is the last thing you do when all repairs have been made?	a. Check for leaks and proper operation
4. How does water enter the dashpot chamber on the piston type flushometer?	c. Bypass line